

Wind Power Inverters

WINDY BOY 3000TL / 3600TL / 4000TL / 5000TL

Installation Manual

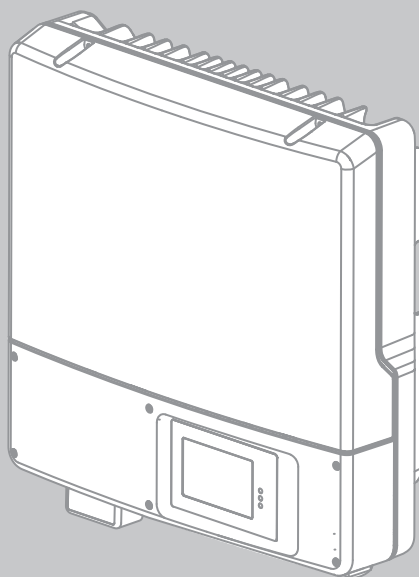


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1 Information about this document

Validity

This document is valid for the following device types as of firmware version 2.10:

- WB 3000TL-21
- WB 3600TL-21
- WB 4000TL-21
- WB 5000TL-21

Target Group

This document is intended for qualified persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks described in this document (see Section 2.2 "Skills of Qualified Persons", page 11).

Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Document title	Document type
Miniature Circuit-Breaker	Technical information
Measured Values and Parameters	Technical description
SMA Bluetooth – SMA Bluetooth® Wireless Technology in Practice	Technical information
SMA Bluetooth® Wireless Technology	Technical description

Symbols

Symbol	Explanation
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	Indicates a hazardous situation which, if not avoided, can result in death or serious injury
 CAUTION	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, could result in property damage
	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates an essential requirement for achieving a specific goal
☒	Desired result
x	A problem that could occur

Typographies

Typography	Use	Example
bold	• Display messages • Parameters • Connections • Elements on an interface text • Elements to be selected • Elements to be entered	• Select the Set country standard parameter and adjust the required country data set.
[Button]	• Button on a user interface	• Select [Device selection].

Nomenclature

Complete designation	Designation in this document
Torque	Torque
Electronic Solar Switch	ESS
Small wind turbine system	Small wind turbine system, plant
SMA Bluetooth® Wireless Technology	Bluetooth
Windy Boy	Inverter, product

Abbreviations

Abbreviations	Designation	Explanation
AC	Alternating Current	–
DC	Direct Current	–
EC	European Community	–
EMC	Electromagnetic Compatibility	–
LED	Light-Emitting Diode	–
MSL	Mean Sea Level	–
NetID	Network Identification	Identification number for SMA Bluetooth network
PC	Personal Computer	–
PE	Protective Earth	Protective conductor
SWTS	Small Wind Turbine System	–
VDE	Verband der Elektrotechnik Elektronik Informationstechnik e.V.	Association for Electrical, Electronic and Information Technologies

2 Safety

2.1 Intended Use

The Windy Boy is a transformerless wind power inverter that converts the rectified alternating current of a small wind turbine system or other energy converters based on permanent magnet electric generators into alternating current suitable for the grid and feeds this energy into the power distribution grid or stand-alone grid.

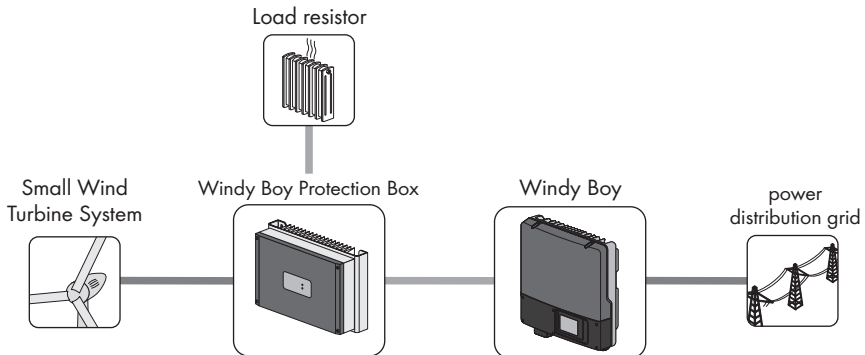


Figure 1: Principle of a small wind turbine system with Windy Boy

The Windy Boy is suitable for indoor and outdoor use.

The Windy Boy may only be used with small wind turbine systems or with energy converters based on permanent magnet electric generators (e.g. water energy plants, CHP plants, diesel generators). The small wind turbine system or energy converter must be suitable for use with the Windy Boy and approved by the small wind turbine system or energy converter manufacturer. SMA Solar Technology recommends operating Windy Boy together with a small wind turbine system without neutral grounding.

The Windy Boy must not be connected to a direct current supply grid.

An overvoltage protection must be installed between the Windy Boy and the rectifier to limit the direct voltage. Use only an overvoltage protection that is designed for the maximum power of the small wind turbine system. SMA Solar Technology recommends using the Windy Boy Protection Box of type 500-11. If you are not using the Windy Boy Protection Box of type 500-11, you must install a capacity of at least 120 μF between the Windy Boy and the rectifier. A low DC voltage ripple has a positive effect on the electrical endurance of the inverter.

All components must remain within their permitted operating ranges at all times.

Alternative uses of the Windy Boy not expressly recommended by SMA Solar Technology AG are not permitted.

The Windy Boy must not be connected in parallel with other inverters on the DC side.

For safety reasons, it is not permitted to modify the product or install components that are not explicitly recommended or distributed by SMA Solar Technology AG for this product.

Before carrying out work on the inverter and before the ESS can be removed, the small wind turbine system must always be stopped and secured against restart. Disconnecting the inverter and removing the ESS while the small wind turbine system is running can cause damage to the small wind turbine system and the inverter due to the resulting rapid discharge.

- Do not mount the Windy Boy on flammable construction materials.
- Do not mount the Windy Boy near areas containing highly flammable materials.
- Do not mount the Windy Boy in potentially explosive areas.

The enclosed documentation is an integral part of this product.

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

2.2 Skills of Qualified Persons

The tasks described in this document must be performed by qualified persons only. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge of and adherence to this document and all safety precautions

2.3 Safety Precautions

Electric Shock

High voltages that can cause fatal electric shocks when touched are present in the live components of the inverter.

- Prior to performing any work on the inverter, disconnect it from any voltage source as described in this document (see Section 9).

Burn Hazards

Some parts of the enclosure can become hot during operation.

- Do not touch any parts other than the lower enclosure lid of the inverter during operation.

Electrostatic Discharge

By touching electronic components, you can damage or even destroy the inverter through electrostatic discharge (ESD).

- Ground yourself before touching any components.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your specialty retailer if the scope of delivery is incomplete or damaged.

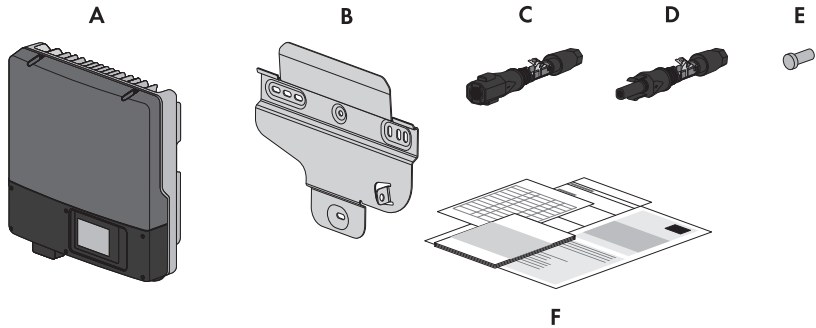


Figure 2: Components included in the scope of delivery

Position	Quantity	Description
A	1	Inverter
B	1	Wall mounting bracket
C	4	Positive DC connector
D	4	Negative DC connector
E	8	Sealing plug
F	1	Installation manual, user manual, document set with explanations and certificates, supplementary sheet with the default settings

4 Product Description

4.1 Windy Boy

The Windy Boy is a transformerless wind power inverter that converts the alternating current of a small wind turbine system into alternating current suitable for the grid and feeds this energy into the power distribution grid or stand-alone grid.

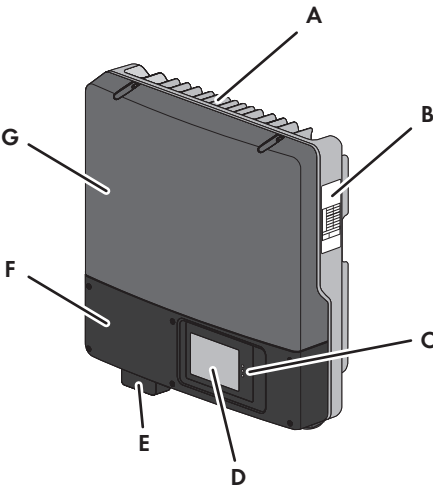


Figure 3: Design of the Windy Boy

Position	Description
A	Cooling fins
B	Type label
C	LEDs
D	Display
E	Electronic Solar Switch (ESS)
F	Lower enclosure lid
G	Upper enclosure lid

Symbols on the inverter

Symbol	Description	Explanation
	Inverter	This symbol defines the function of the green LED. The green LED indicates the operating state of the inverter.
	Observe documentation	This symbol defines the function of the red LED. The red LED indicates an error. Read this document to remedy the error.
	Bluetooth	This symbol defines the function of the blue LED. The blue LED indicates that the Bluetooth communication is enabled.
	QR Code®	The QR Code® refers to the SMA bonus program (for information on this, see www.SMA-Bonus.com).
	Danger	If a second protective conductor is required, also ground the enclosure (see Section 6.3.3).
	Danger to life due to high voltages in the inverter; observe waiting time.	High voltages that can cause fatal electric shocks are present in the live components of the inverter. Disconnect the inverter from any voltage sources before performing any work on it (see Section 9).

4.2 Type Label

The type label provides a unique identification of the inverter. The type label is on the right-hand side of the enclosure.

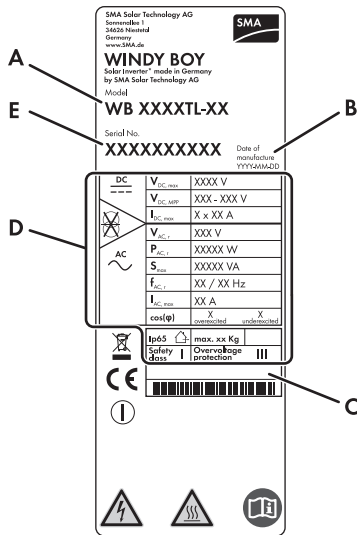


Figure 4: Layout of the type label

Position	Description	Explanation
A	Model	Inverter device type
B	Date of manufacture	Inverter manufacture date (year-month-day)
C	Additional information	Field for additional information, e.g. standard information
D	Device-specific characteristics	-
E	Serial No.	Inverter serial number

You will require the information on the type label to use the inverter safely and when seeking customer support from the SMA Service Line. The type label must be permanently affixed to the inverter.

Symbols on the type label

Symbol	Description	Explanation
	Danger to life due to high voltages.	The product operates at high voltages. All work on the inverter must be carried out by qualified persons only.
	Risk of burns from hot surfaces	The product can become hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.
	Observe documentation	Observe all documentation that is supplied with the product.
	DC	Direct current
	Without transformer	The product does not have a transformer.
	AC	Alternating current
	WEEE designation	Do not dispose of the product together with the household waste but in accordance with the locally applicable disposal regulations for electronic waste.
	CE marking	The product complies with the requirements of the applicable EC directives.
	Device class ID	The product is equipped with a wireless component and complies with device class 2.
	Degree of protection	The product is protected against dust intrusion and water jets from any angle.
	Outdoor	The product is suitable for outdoor installation.
	RAL quality mark for solar products	The product complies with the requirements of the German Institute for Quality Assurance and Certification.

Symbol	Description	Explanation
	Certified safety	The product is VDE-tested and complies with the requirements of the German Equipment and Product Safety Act.
	C-Tick	The product complies with the requirements of the applicable Australian EMC standards.

4.3 Display

The display shows the current operating data of the inverter (e.g. current power, daily energy, total energy) as well as events or errors. The power and energy are displayed as bars in the diagram. There is a slot for an SD card on the left edge of the display enclosure. You can use the SD card to carry out an inverter firmware update, for example (for information on firmware updates with an SD card see the technical description "Firmware Update with SD Card" at www.SMA-Solar.com).

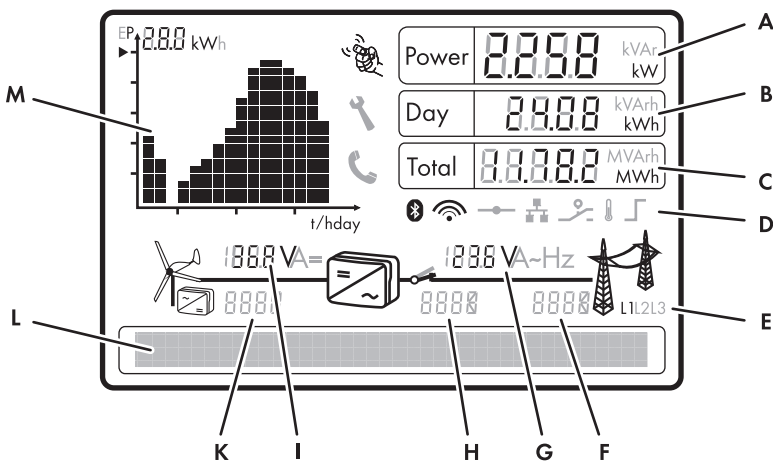


Figure 5: Display layout (example)

Position	Description	Explanation
A	Power	Current power
B	Day	Daily energy
C	Total	Displays the total amount of energy fed in up until now
D	Active functions	The different symbols indicate which functions for communication, grid management or temperature derating are enabled or active.

Position	Description	Explanation
E	Line conductor	Indicates which line conductor the displayed values are assigned to.
F	Event number relating to the power distribution grid	Event number of errors relating to the power distribution grid
G	Output voltage/ output current	Displays output voltage and output current of a line conductor in alternation
H	Event number relating to the inverter	Event number of errors relating to the inverter
I	Input voltage/ input current	Displays input voltage and input current of one input in alternation
K	Event number relating to the small wind turbine system	Event number of errors relating to the small wind turbine system
L	Text line	Displays the event message or error message
M	Power and yield curve	Changes in power over the last 16 feed-in hours or the energy yields over the last 16 days In order to switch between the displays, tap once on the enclosure lid

Symbols on the display

Symbol	Description	Explanation
	Tapping	You can operate the display by tapping on the enclosure lid: - Tapping once: to activate the backlight, to scroll to the next text line, to switch between the power graphs of the last 16 feed-in hours and the energy yields of the last 16 days. - Tapping twice: the display shows, in succession, the firmware version, the serial number or designation of the inverter, NetID, the configured country data set and display language.
	Telephone receiver	Indicates that an error cannot be rectified on site Contact the SMA Service Line.

Symbol	Description	Explanation
	Wrench	Indicates that an error can be rectified on site
	<i>Bluetooth</i>	Indicates that an active <i>Bluetooth</i> connection is established
	<i>Bluetooth</i> connection quality	Indicates the quality of the <i>Bluetooth</i> connection to other <i>Bluetooth</i> devices
	Speedwire	If a Speedwire data module is installed in the inverter, this symbol indicates that there is a connection to a network.
	Webconnect function	If a Webconnect data module is installed in the inverter, this symbol indicates that it is possible to connect to the Sunny Portal.
	Multi-function relay	Indicates that the multi-function relay is active
	Thermometer	Indicates that the power of the inverter is limited due to excessive temperature
	Power limitation	Indicates that the external active power limitation via the plant control is active
	Small wind turbine system with rectifier	-
	Inverter	-
	Grid relay	A closed grid relay indicates that the inverter is feeding into the power distribution grid. An open grid relay shows that the inverter is disconnected from the power distribution grid.
	Power distribution grid	-

4.4 Bluetooth

The inverter is equipped as standard with a *Bluetooth* interface and can communicate with special SMA communication products or other inverters (for information on supported products, see www.SMA-Solar.com).

If you would like to communicate via *Bluetooth*, you can protect the inverter with one plant password for the user and one plant password for the installer.

All inverters are delivered with a standard plant password for the user (0000) and a standard plant password for the installer (1111). To protect the plant from unauthorized access, you must change the plant passwords using Sunny Explorer (for information on changing the plant password, refer to the Sunny Explorer help).

If you do not wish to communicate via *Bluetooth*, deactivate the *Bluetooth* communication (see Section 7.3 "Setting the NetID", page 45).

4.5 Slot for Communication Interface

The inverter can optionally be fitted with an extra communication interface (e.g. RS485). This communication interface enables the inverter to communicate with special SMA communication products (for information on supported products, see www.SMA-Solar.com). The communication interface can be retrofitted or installed by default with the respective order.

Depending on the type of communication, RS485, *Bluetooth*, or Speedwire, the parameters and messages are displayed differently on the communication products.

Example: How the country data set parameter is displayed

- For communication with RS485: **CntrySet** parameter
 - For communication with *Bluetooth* or Speedwire: **Set country standard** parameter
-

4.6 Operating Parameters

Various operating parameters control the functionality of the inverter. You can only adjust all operating parameters of the inverter, excluding the country data set, using an SMA communication product (see Section 8.7). You can adjust the country data set before commissioning or within the first ten feed-in hours via two rotary switches in the inverter (see Section 7.2).

4.7 Slot for Multi-Function Interface

The inverter has a slot for a multi-function interface. This slot is designed to connect a simple multi-function relay, an SMA Power Control Module, or a fan retrofit kit. The multi-function interface can be retrofitted or installed by default with the respective order.

Multi-Function Relay

You can configure the multi-function relay for various operating modes. The multi-function relay is used, for example, to switch error indicators on or off (for information on installation and configuration, see installation manual of the multi-function relay).

SMA Power Control Module

The SMA Power Control Module enables the inverter to implement grid management and is equipped with an additional multi-function relay (for information on installation and configuration, see the SMA Power Control Module installation manual).

Fan Retrofit Kit

The fan retrofit kit is used for additional inverter cooling at high ambient temperatures and also has a multi-function relay (for information on installation and configuration, see the fan retrofit kit installation manual). The fan retrofit kit and the SMA Power Control Module cannot be operated in parallel.

4.8 Grid Management

The inverter is equipped with grid management functions.

Depending on the requirements of the grid operator, you can activate and configure the functions (e.g. provision of reactive power, active power limitation) via operating parameters (for information on the functions and operating parameters, see the Technical Description "Measured Values and Parameters" at www.SMA-Solar.com).

4.9 Varistors

Varistors are voltage-dependent resistors that protect the inverters against overvoltage. The inverter is equipped with thermally monitored varistors.

Varistors can become worn and lose their protective function with age or repeated strain as a result of overvoltage. The inverter detects if one of the varistors is defective and displays an error message.

The varistors are specially manufactured for use in the inverter and are not commercially available. You must order new varistors directly from SMA Solar Technology AG.

4.10 SMA Grid Guard

SMA Grid Guard acts as an automatic disconnection device between a grid-parallel generator (e.g. a PV plant or small wind turbine system) and the power distribution grid.

Furthermore, SMA Grid Guard is a grid monitoring concept which detects errors by permanently monitoring grid impedance, line voltage and power frequency. For example, SMA Grid Guard detects when a stand-alone grid is formed and immediately disconnects the inverter from the power distribution grid.

In some countries, the connection conditions require a device which protects grid-relevant operating parameters against unpermitted changes. SMA Grid Guard assumes this function and protects the setting of the country data set after the first 10 feed-in hours. After the first 10 feed-in hours the country data set can only be changed using a communication product and after a personal access code has been entered, the SMA Grid Guard code. You can obtain the SMA Grid Guard code from SMA Solar Technology AG (for application for the SMA Grid Guard code, see certificate "Application for SMA Grid Guard-Code" at www.SMA-Solar.com).

5 Mounting

5.1 Selecting the Mounting Location

Requirements for the mounting location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in a potentially explosive atmosphere.

- ☐ The mounting location must be inaccessible to children.
- ☐ A solid foundation must be available for mounting, e.g. concrete or masonry. When mounted on plasterboard or similar materials in a living area, the inverter will develop audible vibrations during operation, which could be considered disturbing.
- ☐ The mounting location must be suitable for the weight and dimensions of the inverter (see Section 13 "Technical Data", page 77).
- ☐ The mounting location must be easily and safely accessible at all times without the use of additional aids being necessary, e.g., scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict servicing.
- ☐ The mounting location must not be exposed to direct solar irradiation. Direct solar irradiation can overheat the inverter. As a result, the inverter reduces its power output.
- ☐ Climatic conditions must be met (see Section 13 "Technical Data", page 77).
- ☐ The ambient temperature must be below 40°C to ensure the optimal operation of the inverter.

Dimensions for wall mounting:

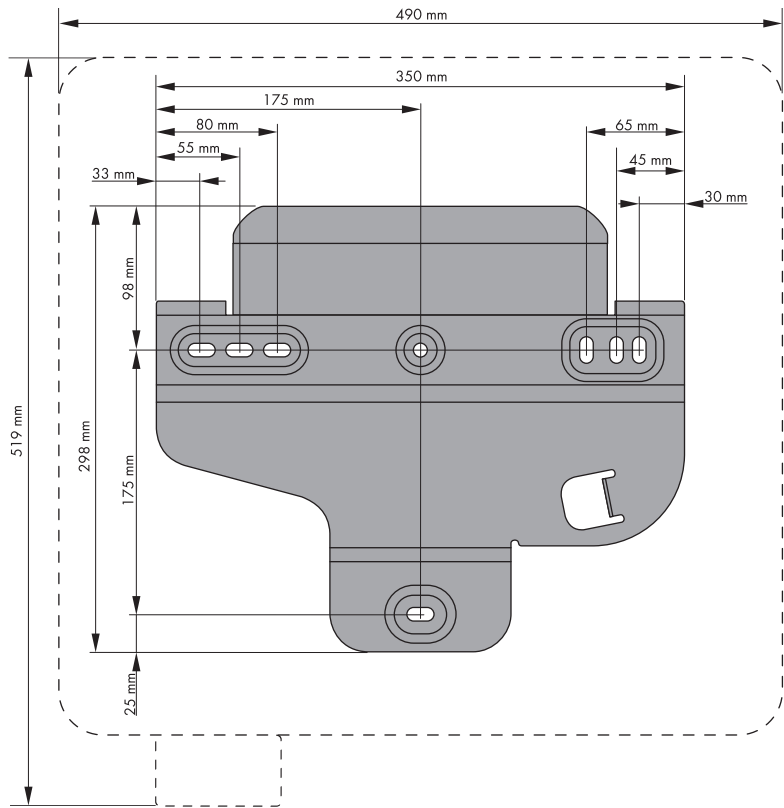


Figure 6: Wall mounting bracket dimensioning

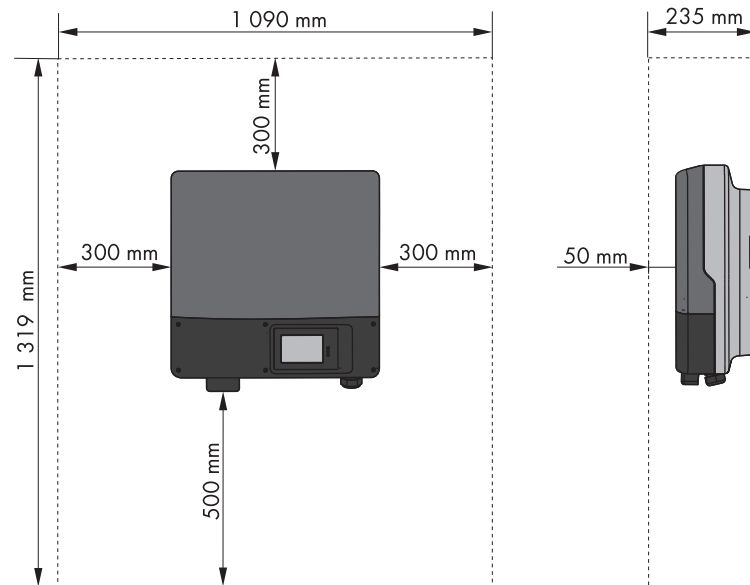
Observe recommended clearances:

Figure 7: Recommended clearances

- Observe minimum clearances to the walls as well as to other inverters or objects. This ensures adequate heat dissipation and sufficient space to remove the ESS.
 - If multiple inverters are mounted in areas with high ambient temperatures, increase the clearances between the inverters and ensure sufficient fresh-air supply.
- ☒ This prevents a reduction in inverter power as a result of high temperatures (for details on temperature derating, see the Technical Information "Temperature Derating" at www.SMA-Solar.com).

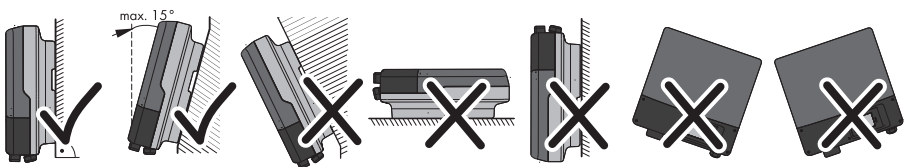
Observe permitted mounting position:

Figure 8: Permitted and prohibited mounting positions

- Mount the inverter in a permitted mounting position. The display should be mounted at eye level.
 - ☒ Mounting the inverter in a permissible position will ensure that no moisture can penetrate the inverter.
 - ☒ By mounting the device at eye level, display messages and LED signals can be read without difficulty.

5.2 Mounting the Inverter

Anti-theft device:

You can protect the inverter from theft with a padlock. The padlock locks the inverter to the wall mounting bracket.

The device must meet the following requirements:

- ☐ The material must be resistant to corrosion.
- ☐ The lock shackle must be hardened.
- ☐ The lock cylinder must be secured.
- ☐ If it is mounted outdoors, the padlock must be weather-proof.
- ☐ The function must be guaranteed for the electrical endurance of the inverter.

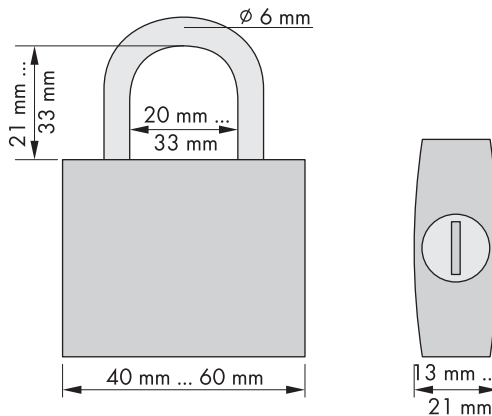
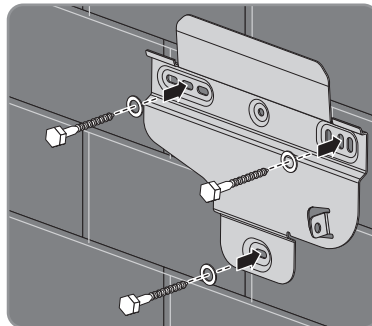


Figure 9: Dimensions of the padlock for the anti-theft device

Additionally required mounting material (not included in the scope of delivery):

- ☐ 3 screws (minimum diameter 6 mm) that are suitable for the foundation
 - ☐ 3 washers (minimum external diameter 18 mm) that are suitable for the screws
 - ☐ 3 screw anchors that are suitable for the foundation
 - ☐ If the inverter is to be protected against theft, 1 padlock
1. Ensure that there are no lines laid in the wall which could be damaged when drilling.

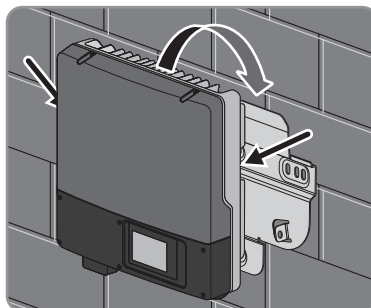
2. Mark the position of the drill holes using the wall mounting bracket. Use at least two holes on the left-hand and right-hand side and the lower hole in the wall mounting bracket.
Tip: When mounting on a post, use the upper and lower central holes.
3. Drill the holes and insert the screw anchors.
4. Secure the wall mounting bracket horizontally to the wall using screws and washers.



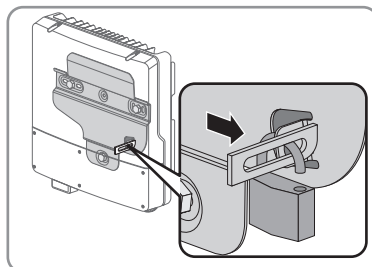
5. **⚠ CAUTION**

Risk of injury when hanging the inverter in the wall mounting bracket

- Keep in mind the weight of the inverter (see Section 13 "Technical Data", page 77).
- Hang the inverter in the wall mounting bracket. Use the recessed grips at the side and transport the inverter in a horizontal position.



6. Ensure that the inverter is securely seated.
7. To protect the inverter from theft, attach a padlock:
 - Place the shackle of the padlock through the metal lug on the wall mounting bracket and through the lug on the rear of the inverter. As you do so, move the shackle outward from the center of the inverter.



- Close the shackle.

6 Electrical Connection

6.1 Safety during Electrical Connection

Electric Shock

High voltages that can cause fatal electric shocks when touched are present in the live components of the inverter.

- Prior to performing any work on the inverter, disconnect it from any voltage source as described in this document (see Section 9).

Electrostatic Discharge

Touching electronic components can cause damage to or destroy the inverter through electrostatic discharge.

- Ground yourself before touching any components.

6.2 Overview of the Connection Area

6.2.1 View from Below

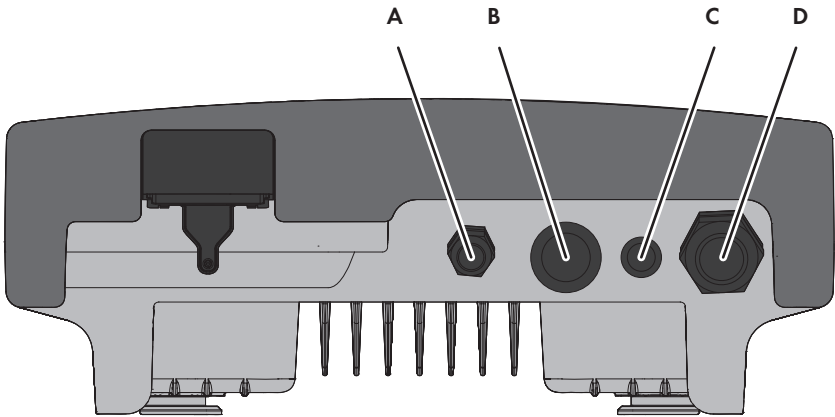


Figure 10: Enclosure openings at the bottom of the inverter

Position	Description
A	Cable gland M20x1.5 for connection to the multi-function interface or connection of the fan retrofit kit
B	Enclosure opening with filler-plug for connection to the communication interface
C	Enclosure opening with filler-plug for connection to the communication interface
D	Cable gland M32x1.5 for connection to the power distribution grid

6.2.2 Interior View

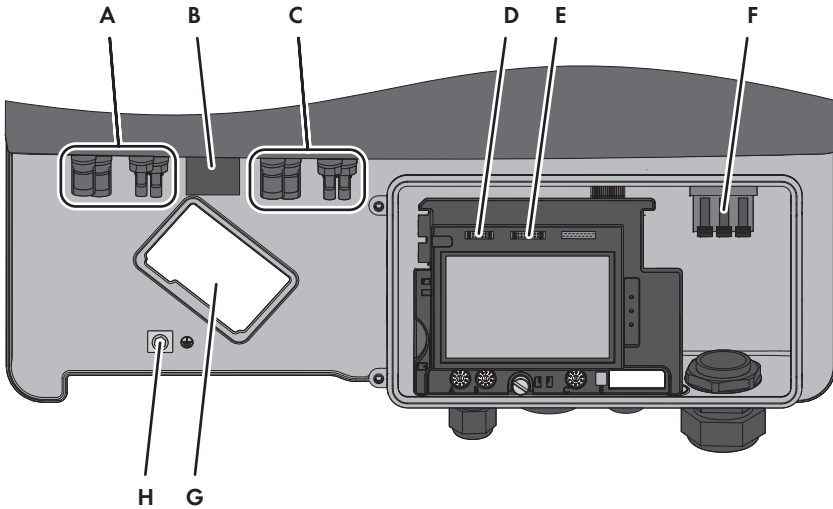


Figure 11: Connection areas in the interior of the inverter

Position	Description
A	2 positive and 2 negative DC connectors, input A
B	Jack for plugging in the ESS
C	2 positive and 2 negative DC connectors, input B
D	Jack for connecting the multi-function interface
E	Jack for connecting the communication interface
F	Connecting terminal plate for connecting the AC cable
G	Installation location for retrofitted fan
H	Ground terminal for additional grounding of the inverter

6.3 AC Connection

6.3.1 Conditions for the AC Connection

Cable requirements:

- ☐ External diameter: 12 mm to 21 mm
- ☐ Maximum wire size: maximal 10 mm²
- ☐ Stripping length: 12 mm

- The cable must be dimensioned in accordance with the local and national directives for the dimensioning of cables. The requirements for the minimum wire size derive from these directives. Influencing factors for cable dimensioning are, among others, the following: nominal AC current, type of cable, routing method, cable bundling, ambient temperature, and maximum desired line losses.

Switch-disconnector and cable protection:

NOTICE

Damage to the inverter due to the use of screw-type fuses as load disconnection units

Screw-type fuses (e.g. DIAZED fuses or NEOZED fuses) are not switch-disconnectors

- Do not use screw-type fuses as load disconnection units.
- Use a switch-disconnector or miniature circuit-breaker as a load disconnection unit (for information and examples for designing, see the Technical Information "Miniature Circuit-Breaker" at www.SMA-Solar.com).
- In plants with multiple inverters, protect every inverter with a separate miniature circuit-breaker. Observe the maximum permissible fuse protection (see Section 13 "Technical Data", page 77). That prevents residual voltage being present at the corresponding cable after disconnection.
- Loads installed between the inverter and the miniature circuit-breaker must be protected separately.

Residual-current device:

- If an external residual-current device is prescribed, install a residual-current device that trips at a residual current of 100 mA or higher (for information on choice of residual-current devices, see the Technical Information "Criteria for Selecting a Residual-Current Device" at www.SMA-Solar.com).

Protective conductor monitoring:

The inverter is equipped with protective conductor monitoring that detects if the protective conductor is not connected and if this is the case, disconnects the inverter from the power distribution grid. Depending on the installation site and grounding system, it may be advisable to deactivate the protective conductor monitoring. Ask your grid operator or SMA Solar Technology AG to advise.

- To ensure safety according to IEC 62109 when the protective conductor monitoring is deactivated, connect a protective conductor to the connecting terminal plate for the AC cable (minimum cross-section: 10 mm², copper wire).

or

Connect a second protective conductor with the same wire size as the original protective conductor (see Section 6.3.3 "Additional Grounding of the Enclosure", page 34). This prevents touch current if the original protective conductor fails.



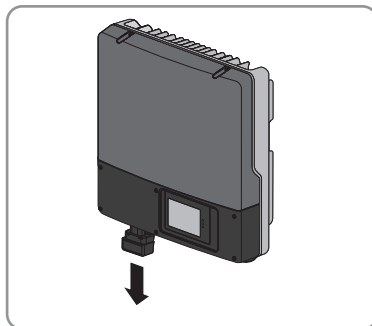
Connection of a second protective conductor

In some countries a second protective conductor is required as a matter of principle. In each case, observe the local applicable regulations.

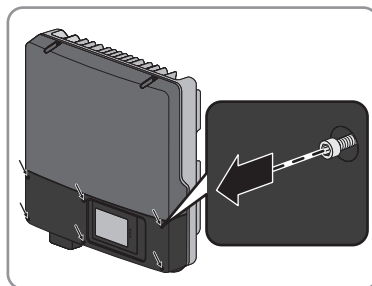
6.3.2 Connecting the Inverter to the Power Distribution Grid

Requirements:

- ☐ The connection requirements of the grid operator must be met.
 - ☐ The line voltage must be within the permissible range. The exact operating range of the inverter is specified in the operating parameters (see the Technical Description "Measured Values and Parameters" at www.SMA-Solar.com).
1. Stop the small wind turbine system and secure against restart.
 2. Disconnect the miniature circuit-breaker and secure against re-connection.
 3. Remove the ESS.

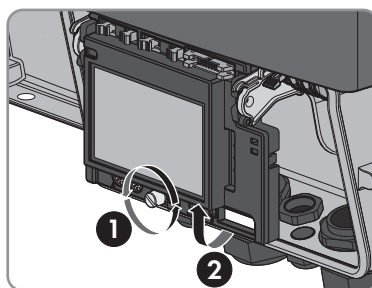


4. Loosen all six screws of the lower enclosure lid using an Allen key (AF 3) and remove the enclosure lid.

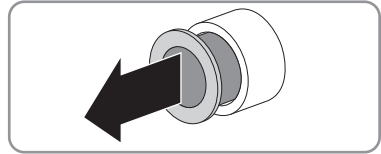


5. Flip the display up to have more space to make the connection. Loosen the screw on the display to do this.

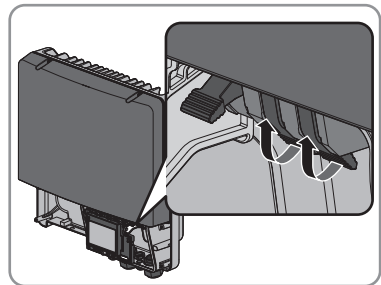
☒ The display clicks into place.



6. If the diameter of the AC cable is between 15 mm and 21 mm, remove the insert from the seal in the AC cable gland:
 - Unscrew the swivel nut of the AC cable gland.
 - Remove the insert in the seal of the AC cable gland.



- Screw the swivel nut a little way onto the AC cable gland. Do not fully tighten the swivel nut.
7. Strip the AC cable insulation.
 8. Shorten L and N by 5 mm each.
 9. Strip 12 mm of the L, N, and PE insulation each.
 10. Route the AC cable into the inverter through the cable gland. If necessary, slightly loosen the swivel nut of the cable gland.
 11. Push the safety levers of the connecting terminal plate for the AC cable right up to the stop.

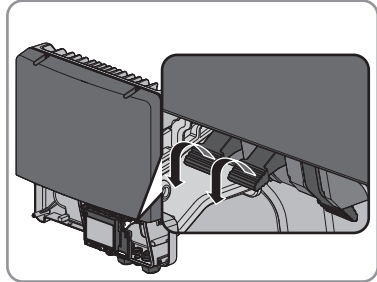


12. Connect the AC cable to the connecting terminal plate for the AC cable:
 - Connect PE to the  terminal.
 - Connect N to the **N** terminal.
 - Connect L to the **L** terminal.

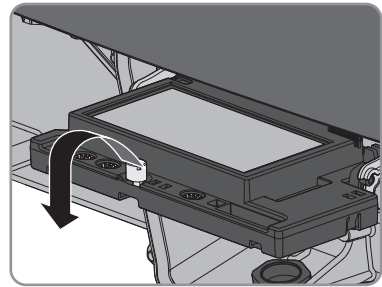
13. **⚠ CAUTION****Danger of crushing when safety levers snap shut**

The safety levers close by snapping down fast and hard.

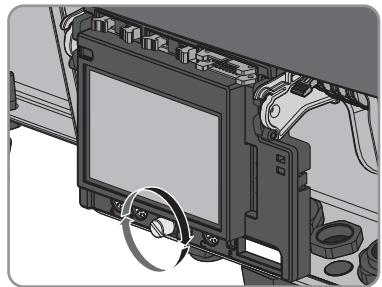
- Only press the safety levers on the terminals down with your thumb. Do not grasp the entire connecting terminal plate for the AC cable and do not place your fingers under the safety levers.



14. If the display is still raised, lower it again.



15. Fasten the screw on the display hand-tight.



16. Retighten the swivel nut of the AC cable gland.

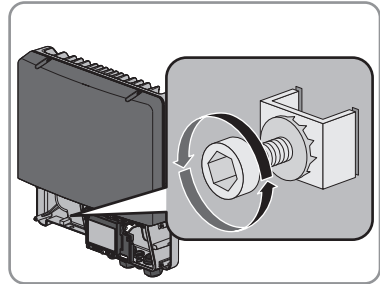
6.3.3 Additional Grounding of the Enclosure

If a second protective conductor or equipotential bonding is required locally, you can also ground the enclosure. This prevents touch current if the original protective conductor fails.

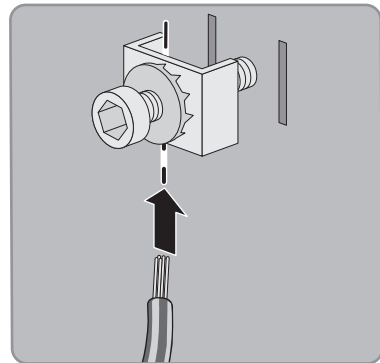
Cable requirement:

- Maximum grounding cable cross-section: 10 mm²

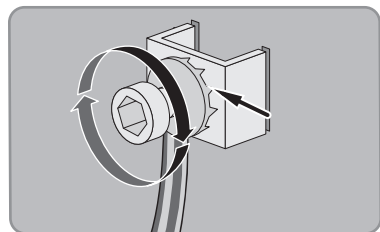
1. Strip the grounding cable insulation.
2. Loosen the screws using an Allen key (AF 4), until the grounding cable can be led under the clamping bracket.



3. Feed the grounding cable under the clamping bracket. Set the protective conductor to the left.



4. Tighten the clamping bracket with the screw and conical spring washer (torque: 6 Nm). The teeth of the conical spring washer must face the clamping bracket.



6.4 DC Connection

6.4.1 Connecting the Connection Cables to DC Connectors

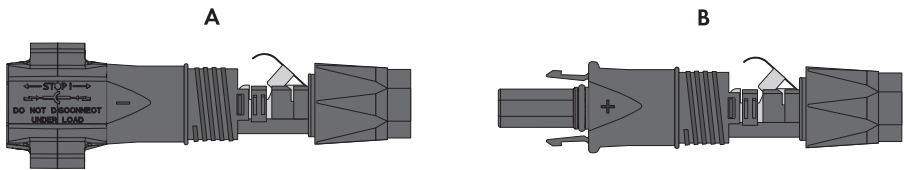


Figure 12: DC connectors

Position	Description
A	Negative DC connector
B	Positive DC connector

Required material (not included in the scope of delivery):

- ☐ 2 PV1-F cables for connecting the rectifier (maximum length: 30 m)
- ☐ 2 PV1-F cables for bridging the DC inputs on the inverter (length: 25 cm to 35 cm)

Cable requirements:

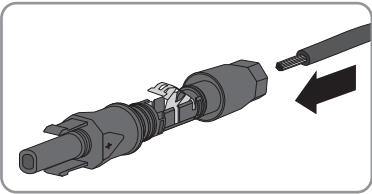
- ☐ External diameter: 5 mm to 8 mm
- ☐ Wire size: 2.5 mm² to 6 mm²

Assigning the PV1-F cables to the DC connectors:

- Connect one PV1-F cable for connecting the rectifier to a positive DC connector.
- Connect one PV1-F cable for connecting the rectifier to a negative DC connector.
- Connect each end of the PV1-F cable for bridging the DC inputs to a positive DC connector.
- Connect each end of the PV1-F cable for bridging the DC inputs to a negative DC connector.

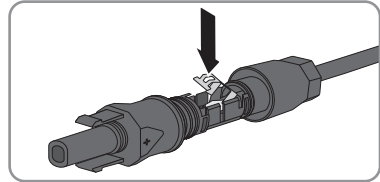
Connect each connection cable to the appropriate DC connector according to the following procedure.

1. Strip the insulation of the cable by 12 mm.
2. Lead the stripped cable all the way into the DC connector. Ensure that the stripped cable and the DC connector have the same polarity.

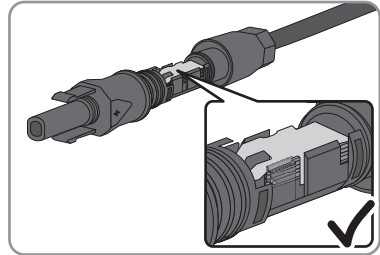


3. Press the clamping bracket down.

☑ The clamping bracket snaps audibly into place.



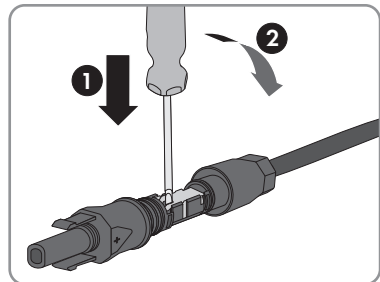
☑ The stranded wire can be seen inside the clamping bracket chamber.



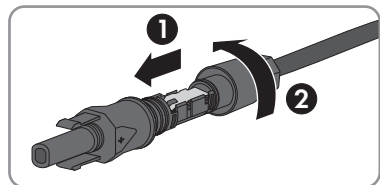
✗ The stranded wire cannot be seen in the chamber.

The cable is not positioned correctly.

- Loosen the clamping bracket. To do so, insert a screwdriver (blade width: 3.5 mm) into the clamping bracket and lever it out.
- Remove the cable and start again from step 2.



4. Push the swivel nut up to the thread and tighten (torque: 2 Nm).



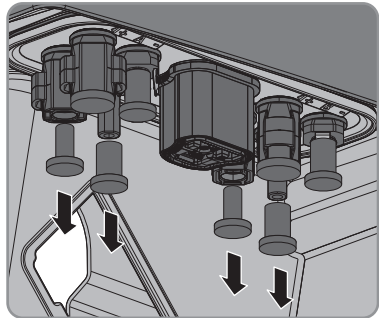
6.4.2 Bridging the DC Inputs on the Inverter

Requirements:

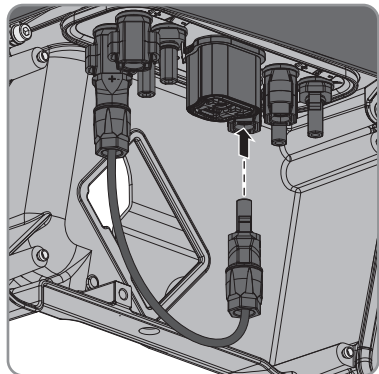
- ☐ A negative connection cable to bridge the DC inputs on the inverter must be equipped with two negative DC connectors.
- ☐ A positive connection cable to bridge the DC inputs on the inverter must be equipped with two positive DC connectors.

Bridge the two rear DC connectors of input A with the two rear DC connectors of input B according to the following procedure.

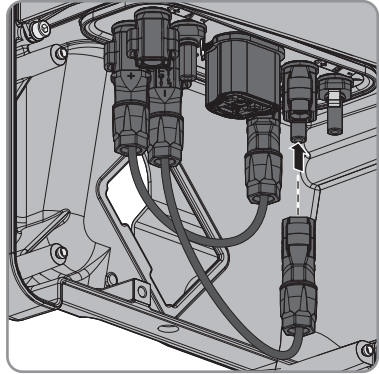
1. Stop the small wind turbine system and secure against restart.
2. Disconnect the miniature circuit-breaker and secure against re-connection.
3. If the ESS is plugged in, remove the ESS.
4. Remove the filler-plugs from the rear DC connectors of both inputs on the inverter.



5. Connect the positive DC connectors of input A with the positive DC connectors of input B.



6. Connect the negative DC connectors of input A with the negative DC connectors of input B.



6.4.3 Connecting the Rectifier

Requirements:

- ☐ The rear DC inputs on the inverter must be bridged.
- ☐ The positive connection cable of the rectifier must be fitted with a positive DC connector.
- ☐ The negative connection cable of the rectifier must be fitted with a negative DC connector.

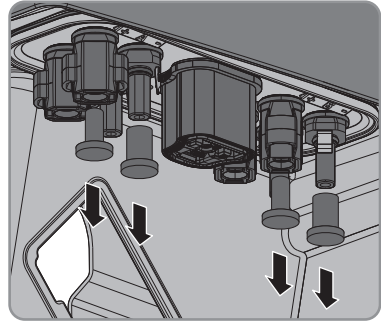
NOTICE

Destruction of the inverter due to overvoltage

If the open-circuit voltage of the plant exceeds the maximum input voltage of the inverter, the inverter can be destroyed by overvoltage.

- Install overvoltage protection between the inverter and the rectifier.
- If the open-circuit voltage of the plant exceeds the maximum input voltage of the inverter, do not connect any DC cables to the inverter and check the design of the plant.

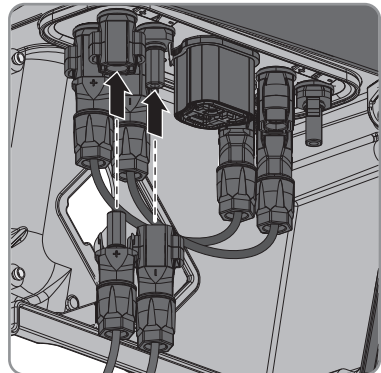
1. Remove the filler-plugs from the front DC connectors of both inputs on the inverter.



2. Check the connection cables of the rectifier for ground faults (see Section 11.4).
3. Connect the rectifier to the inverter:

- Connect the positive connection cable to the front positive DC connector of input A on the inverter.
- Connect the negative connection cable to the front negative DC connector of input A on the inverter.

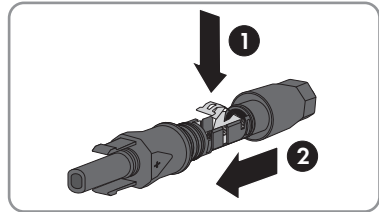
☑ The DC connectors click audibly into place.



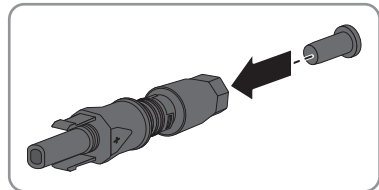
4. **NOTICE****Damage to the inverter due to moisture penetration**

The inverter is only properly sealed when all the unused DC inputs are sealed with DC connectors and sealing plugs.

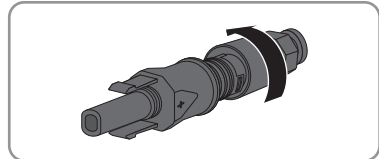
- Do **NOT** insert the sealing plugs **DIRECTLY** into the DC inputs on the inverter.
- For unused DC connectors, push down the clamping bracket and push the swivel nut up to the thread.



- Insert the sealing plug into the DC connector.

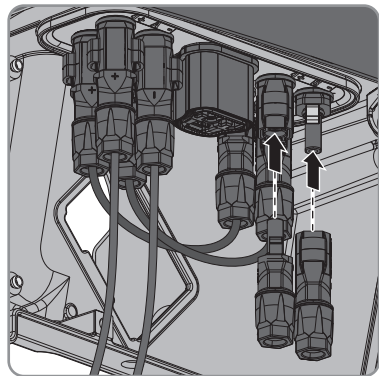


- Tighten the DC connector (torque: 2 Nm).



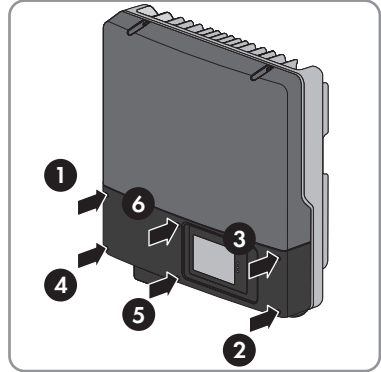
- Insert the DC connectors with sealing plugs into the corresponding DC inputs on the inverter.

- ☒ The DC connectors click audibly into place.

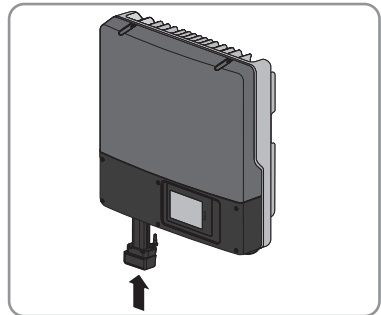


5. Ensure that all DC connectors are securely in place.

6. Place the lower enclosure lid with the 6 screws on the enclosure and secure with screw 6. Then tighten all screws with an Allen key (AF 3) in the order 1 to 6 (torque: 2 Nm).



7. Securely plug in the ESS. The ESS must be aligned parallel to and flush with the enclosure.



7 Initial Start-Up

7.1 Procedure

Before you can commission the inverter, you must check various settings and if necessary make changes. This section describes the procedure for initial start-up and provides an overview of the steps that must always be performed in the given sequence.

Procedure	See
1. Check the country data set configuration of the inverter.	Type label or supplementary sheet with default settings
2. If the country data set is not correctly configured for your country or purpose, adjust the desired country data set and the associated display language.	Section 7.2
3. If the inverter will communicate with several <i>Bluetooth</i> devices, or if <i>Bluetooth</i> will not be used as a type of communication, configure NetID.	Section 7.3
4. Commission the inverter for the first time and start a self-test, if required.	Section 7.4 and Section 7.5

7.2 Configuring the Country Data Set

There is a display language assigned to each country data set. Configure the country data set with the associated display language so it is appropriate for your country or purpose. If the display language is not your desired language, you can change the display language after commissioning (see Section 8.1).



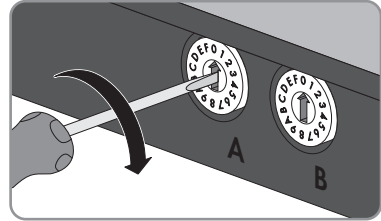
Country data set must be correctly configured

If you configure a country data set that is not valid for your country or purpose, it can cause a disturbance in the plant and lead to problems with the grid operator. When selecting the country data set always observe the locally valid standards and directives, as well as the characteristics of the plant (e.g. dimensions of the plant, grid-connection point, etc.).

- If you are not sure which country data set is valid for your country or purpose, contact your grid operator and ask which country data set should be configured.

1. Ensure that the inverter is disconnected from voltage sources and the lower enclosure lid is open.

2. Using a slotted screwdriver (blade width: 2.5 mm), set rotary switches **A** and **B** to the country data set that is valid for your country or purpose.



☒ The inverter will adopt the setting up to five minutes after commissioning.

Rotary switch positions

Rotary switch A	Rotary switch B	Country data set	Display language
0	0	Default setting	Default setting
1	0	VDE0126-1-1	German
1	2	VDE-AR-N4105*	German
1	4	VDE-AR-N4105-MP**	German
1	6	VDE-AR-N4105-HP***	German
1	8	VDE0126-1-1	French
1	9	VDE0126-1-177/UTE	French
2	0	VDE0126-1-1	Italian
2	8	AS4777.3	English
3	1	CEI 0-21 intern****	Italian
3	2	CEI 0-21 extern*****	Italian
4	0	RD1663-A	Spanish
4	1	RD1663/661-A	Spanish
4	8	PPC	Greek
4	9	PPC	English
5	1	KEMCO501/2009	English
5	2	KEMCO501/2009	Korean
5	8	G83/1-1	English
5	A	G 59/2	English
6	0	EN50438	German
6	1	EN50438	English
6	2	EN50438	French
6	3	EN50438	Italian

Rotary switch A	Rotary switch B	Country data set	Display language
6	4	EN50438	Spanish
6	5	EN50438	Greek
6	6	EN50438	Czech
6	7	EN50438	Portuguese
6	8	EN50438	Bulgarian
6	9	EN50438	Polish
7	0	EN50438-CZ	Czech
7	1	EN50438-CZ	English
7	2	EN50438-CZ	German
7	4	PPDS	Czech
7	5	PPDS	English
7	6	PPDS	German
7	8	C10/11	French
7	9	C10/11	English
7	A	C10/11	German
7	B	C10/11	Dutch
A	C	SI4777-2	English
B	8	IEC61727/MEA	English
B	C	IEC61727/PEA	English
C	0	Other standard	English
C	1	Other standard	German
C	2	Other standard	French
C	3	Other standard	Spanish
C	4	Other standard	Italian
C	5	Other standard	Greek
C	6	Other standard	Czech
D	0	Island mode 60 Hz	English
D	1	Island mode 60 Hz	German
D	2	Island mode 60 Hz	French
D	3	Island mode 60 Hz	Spanish
D	4	Island mode 60 Hz	Italian
D	5	Island mode 60 Hz	Greek

Rotary switch A	Rotary switch B	Country data set	Display language
D	6	Island mode 60 Hz	Czech
E	0	Island mode 50 Hz	English
E	1	Island mode 50 Hz	German
E	2	Island mode 50 Hz	French
E	3	Island mode 50 Hz	Spanish
E	4	Island mode 50 Hz	Italian

* setting in accordance with VDE-AR-N 4105 for plants ≤ 3.68 kVA (Germany)

** setting in accordance with VDE-AR-N 4105 for plants from 3.68 kVA to 13.8 kVA (Germany)

*** setting in accordance with VDE-AR-N 4105 for plants > 13.8 kVA (Germany)

**** planned setting in accordance with CEI 0-21 for plants ≤ 6 kVA (Italy)

***** planned setting according to CEI 0-21 for plants with external grid and plant protection > 6 kVA (Italy)

7.3 Setting the NetID

By default, the NetID is set to **1** for all SMA inverters and SMA communication products with *Bluetooth*. If your plant consists of an inverter and a maximum of one further *Bluetooth* device (e.g. computer with *Bluetooth* or SMA communication product), you can leave the NetID set to **1**.

You must change the NetID in the following cases:

- If your plant consists of an inverter and two further *Bluetooth* devices (e.g. computer with *Bluetooth* or SMA communication product) or of several inverters, you need to change the NetID of your plant. This enables you to communicate with several *Bluetooth* devices.
- If another plant with *Bluetooth* is located within 500 m of your plant, you must change the NetID of your plant. This will help to separate both plants from each other.
- If you do not want to communicate using *Bluetooth*, deactivate the *Bluetooth* communication on your inverter. This protects your plant from unauthorized access.

All *Bluetooth* devices in a plant must have the same NetID. Before commissioning, you can set a new NetID in the inverter by using rotary switch **C**. The setting will be adopted up to five minutes after commissioning.

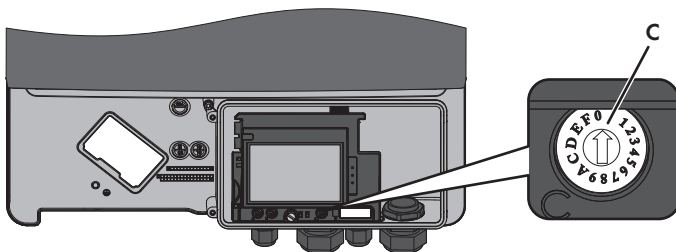
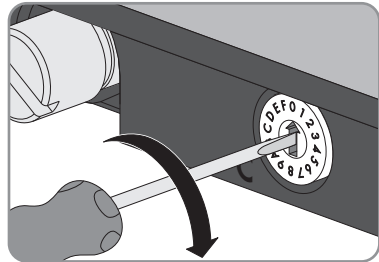


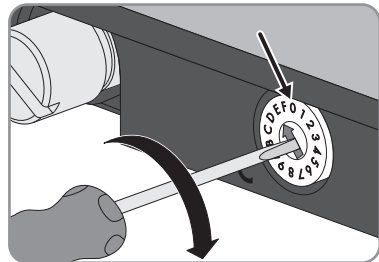
Figure 13: Positions of rotary switch C

Position	Explanation
0	Communication via <i>Bluetooth</i> is disabled.
1	Communication via <i>Bluetooth</i> with a maximum of one other <i>Bluetooth</i> device
2 to F	NetID for communication via <i>Bluetooth</i> with several <i>Bluetooth</i> devices

1. Ensure that the inverter is disconnected from voltage sources and the lower enclosure lid is open.
2. Determine a free NetID using the Sunny Explorer software (see the documentation for the Sunny Explorer software).
3. To configure a new NetID, set the rotary switch **C** to the determined NetID using a slotted screwdriver (blade width: 2.5 mm).



4. To deactivate the communication via *Bluetooth*, set the rotary switch **C** to the position **0** using a slotted screwdriver (blade width: 2.5 mm). This protects your plant from unauthorized access.



☒ The inverter will adopt the setting up to five minutes after commissioning.

7.4 Commissioning the Inverter for the First Time

When commissioning the inverter for the first time, proceed as follows.

Requirements:

- ☐ The AC miniature circuit-breaker must be correctly rated.
- ☐ Overvoltage protection must be installed between the inverter and the rectifier.
- ☐ The inverter must be correctly mounted and closed.
- ☐ All cables must be correctly connected.
- ☐ Unused DC inputs must be sealed using the corresponding DC connectors and sealing plugs.
- ☐ The country data set must be configured according to the country or purpose.
- ☐ The ESS must be securely plugged in.

1. Switch on the miniature circuit-breaker.
2. If the multi-function relay is used, switch on the load supply voltage.
3. Start the small wind turbine system.
 - ☒ The start phase begins.
 - ☒ The green LED is lit and the display shows, in succession, the device type, the firmware version, the serial number or designation of the inverter, the NetID, and the specified country data set and display language.
 - ☒ Green LED flashing?

Possible cause of error: The DC input voltage is still too low, or the inverter is monitoring the power distribution grid.

 - If the DC input voltage is sufficiently high and the grid start-up conditions are met, the inverter starts to operate.
 - ☒ The red LED is lit and an error message and event number appear in the display?
 - Eliminate the fault (see Section 11 "Troubleshooting", page 59).
4. Configure the inverter (see Section 8).

7.5 For Italy Only: Starting the Self-Test

The self-test is only valid for inverters that are configured with the country data set **CEIO-21 Int/CEI 0-21 Intern** and were commissioned in Italy.

The Italian standard requires that all inverters feeding into the power distribution grid are equipped with a self-test function in accordance with CEI 0-21. During the self-test, the inverter will consecutively check the reaction times for overvoltage, undervoltage, maximum frequency and minimum frequency.

The self-test changes the upper and lower trip-limit values for each protective function on a linear basis for frequency monitoring and voltage monitoring. As soon as the measured value exceeds the permitted trip-limit value, the inverter disconnects from the power distribution grid. In this way, the inverter determines the reaction time up to disconnection and checks itself.

After the self-test has been completed, the inverter automatically switches back to the feed-in operation, resets the original calibration values and connects to the power distribution grid.

Requirements:

- ☐ Configured country data set: **CEIO-21 Int/CEI 0-21 Intern** or amended country data set **trimmed/Special setting** based on one of the country data sets mentioned above.
- ☐ A report for entering the test results must be available.
- ☐ The inverter must be in operation and in the start phase.

1. As soon as the configured country data set appears in the display, tap once on the display within ten seconds.
 - ☑ A message informing you that the self-test has started is shown in the display:
Avvio Autotest.
 - ✗ The message **Avvio Autotest** is not shown in the display?
Ten seconds have passed and the self-test has not started.
 - Restart the self-test (see Section 7.5.2).
2. Tap on the display within 20 seconds and enter the test results that follow into the test report.
 - ☑ The self-test starts.
 - ☑ The inverter displays the results of the individual tests for overvoltage, undervoltage, maximum frequency and minimum frequency. The results are displayed three times in succession for ten seconds each.

Example: Display messages for overvoltage test

- Test name: **Autotest Vac Max**
 - Current line voltage: **Vac Max 245,0 V**
 - Disconnection value: **Valore di soglia 233,0 V**
 - Calibration value: **Valore die taratura 276,0 V**
 - Reaction time: **Tempo die intervento 0,08 s**
-

7.5.1 Abortion of the Self-Test

If, during the self-test, an unexpected disconnection requirement occurs, the self-test is aborted. The same applies if the DC voltage is so low that the feed-in cannot be continued.

- A message informing you that the self-test has been aborted is shown in the display for ten seconds: **Autotest interrotto.**
- Restart the self-test (see Section 7.5.2).

7.5.2 Restarting the Self-Test

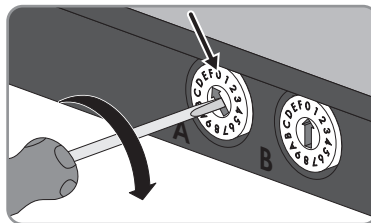
1. Stop the small wind turbine system and secure against restart.
2. Disconnect the miniature circuit-breaker and secure against re-connection.
3. If the multi-function relay is used, switch off the load supply voltage, if necessary.
4. Remove the ESS from the inverter for five minutes and then plug it in again.
5. Commission the inverter again (see section 7.4).
 - ☑ The inverter is once again in the start phase and you can start the self-test (see Section 7.5).

8 Configuration

8.1 Changing the Display Language

If the language associated with the country data set is not your desired language, you can change the display language according to the following procedure.

1. Disconnect the inverter and open the lower enclosure lid (see Section 9).
2. Set the rotary switch **A** to **0** using a slotted screwdriver (blade width: 2.5 mm). This ensures that the country data set remains unchanged.
3. Set the rotary switch **B** to the desired language using a slotted screwdriver (blade width: 2.5 mm):



Position	Display language
0	Default setting
1	English
2	German
3	French
4	Spanish
5	Italian
6	Greek
7	Czech
8	Korean
9	Portuguese
A	Dutch
B	Slovenian
C	Bulgarian
D	Polish

4. Re-commission the inverter (see Section 10).
 - ☑ The inverter will adopt the setting up to five minutes after commissioning.

8.2 Changing the Plant Password and Plant Time

Requirements:

- ☐ A computer with *Bluetooth* interface must be available.
- ☐ Sunny Explorer must be installed on the PC or laptop.
- ☐ The plant must be logged in to Sunny Explorer.
 - Change the standard plant password (see Sunny Explorer help). This protects your plant from unauthorized access.
 - Change the plant time (see Sunny Explorer help).

8.3 Adapting the Polynomial Curve

The polynomial curve is a programmable power curve depending on the DC input voltage. By adapting the polynomial curve of the inverter to the plant being used, you can optimize the energy yield of the plant. To do so, you need the power-voltage characteristic curve for the plant being used. Request the characteristic curve from the manufacturer of the plant.

To set the polynomial curve of the inverter, you must calculate the coefficients of the polynomial curve using the Windy Boy Setup Tool. You can adjust the calculated coefficients with the Sunny Explorer and transfer them to the inverter.

Requirements:

- ☐ A PC or laptop with *Bluetooth* interface must be available.
- ☐ Windy Boy Setup Tool, as of software version 1.05 and Sunny Explorer, as of software version 1.02, must be installed on the computer (for installation file see www.SMA-Solar.com).
- ☐ The plant must be logged in to Sunny Explorer.
- ☐ Power-voltage characteristic curve for the small wind turbine system must be available.
- ☐ AC line voltage or a DC voltage of at least 150 VDC must be present at the inverter.

Procedure:

- Calculate values for polynomial curve with Windy Boy Setup Tool
- Adjust calculated values for polynomial curve with Sunny Explorer

Calculating values for polynomial curve with Windy Boy Setup Tool

1. Open the Windy Boy Setup Tool.
2. Select [**Device selection**].
3. Select the inverter in the **Device type** list
4. If the default inverter parameters have been changed, manually enter the adjusted values of the parameters in the appropriate fields (see the documentation for the Windy Boy Setup Tools).
5. Adjust the polynomial curve (power characteristic curve) (see the documentation for the Windy Boy Setup Tool). In doing so, display the polynomial curve as monotonically increasing.
6. Note the values for the parameters **Wind_a0**, **Wind_a1**, **Wind_a2**, and **Wind_a3**.

Adjusting calculated values for polynomial curve with Sunny Explorer

1. Log in to Sunny Explorer as **Installer** (see Sunny Explorer help).
2. Select the parameter **Constant deviation of power calculation** and set the noted values for parameter **Wind_a0**.
3. Select the parameter **Coefficient of power calculation based on Udc** and set the noted values for parameter **Wind_a1**.
4. Select the parameter **Coefficient of power calculation based on Udc^2** and set the noted values for the parameter **Wind_a2**.
5. Select the parameter **Coefficient of power calculation based on Udc^3** and set the noted values for the parameter **Wind_a3**.
6. Save setting.

8.4 Setting the Deactivation Delay

The deactivation delay is the amount of time that must pass from the moment the DC feed-in conditions are no longer met until the moment the inverter disconnects itself from the power distribution grid.

Requirement:

- ☐ A communication product that is appropriate for the type of communication used must be available.
1. Select the parameter **Deactivation delay** or **T-Stop** and set the desired value.
 2. Save setting.

8.5 Changing the DC Critical Voltage for Feed-in to the Power Distribution Grid

It is possible to change the default setting for the critical voltage to end and/or start feed-in.

Requirement:

- ☐ A communication product that is appropriate for the type of communication used must be available.

Changing the critical voltage to end feed-in

If the default values for ending feed-in are not in the range of the set polynomial curve, you must adjust the critical voltages to the zero-crossing of the power-voltage characteristic curve with the x axis. By doing so, you achieve optimum start-up behavior for the plant.

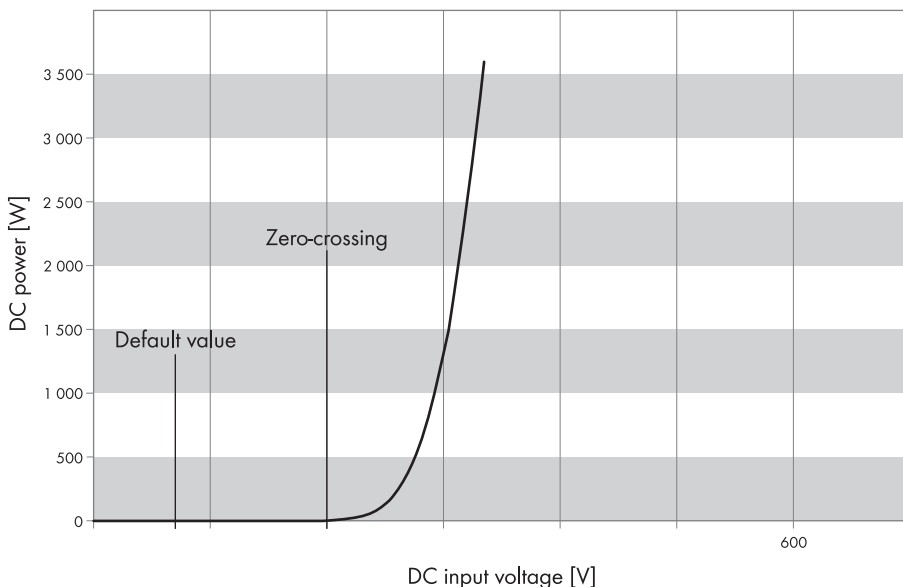


Figure 14: Power-voltage characteristic curve of a small wind turbine system indicating the default value for critical voltage to end feed-in and the zero-crossing of the curve with the x axis (example)

1. Select the parameter **Critical voltage to end feed-in** or **Upv-Stop** and set the desired value.
2. Save setting.

Changing the critical voltage to start feed-in

If it is intended that feed-in to the power distribution grid and stress of the plant are not to start until there is higher DC voltage, change the DC default values as described below.

1. To change the default value for the DC input, select the parameter **Critical voltage to start feed-in** or **A.VStr** and set the desired value.
2. Save setting.

8.6 Connecting the Inverter to Sunny Portal

If the inverter is equipped with the Webconnect data module, you can connect the inverter to the Sunny Portal.

Requirements:

- ☐ The inverter must be equipped with the Webconnect data module.
- ☐ The inverter must be connected to a network with Internet connection.
- Connect the inverter to Sunny Portal and register in the Sunny Portal (see the user manual of Webconnect plants in the Sunny Portal)

8.7 Setting the Operating Parameters

Requirements:

- ☐ A communication product that is appropriate for the type of communication used must be available.
 - ☐ The changes to the grid-relevant parameters must be approved by the responsible grid operator.
 - ☐ For changing the grid-relevant parameters, an SMA Grid Guard code must be available (see certificate "Application for SMA Grid Guard-Code" at www.SMA-Solar.com).
1. Access the user interface of the communication product and log in as "Installer".
 2. If required, enter the SMA Grid Guard code.
 3. Select and set the desired parameter.
 4. Save setting.

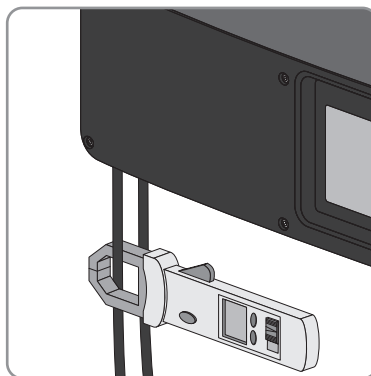
9 Disconnecting the Inverter from Voltage Sources

NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range up to at least 1,000 V.

1. Stop the small wind turbine system and secure against restart.
2. Disconnect the miniature circuit-breaker and secure against re-connection.
3. If the multi-function relay is used, switch off the load supply voltage.
4. Remove the ESS.
5. Wait until the LEDs, display and if necessary, the load connected to the multi-function relay, are switched off.
6. Use a current probe to make sure no current is present in the DC cables.

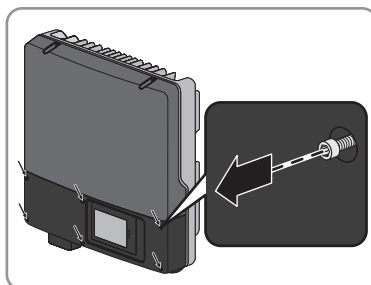


7. DANGER

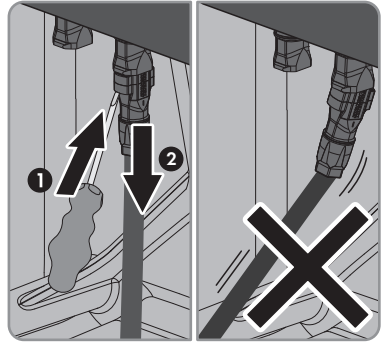
Danger to life due to high voltages

The capacitors in the inverter require five minutes to discharge.

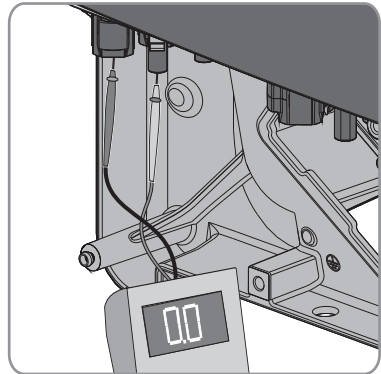
- Wait five minutes before opening the enclosure lid.
8. Loosen all six screws of the lower enclosure lid using an Allen key (AF 3) and remove the enclosure lid.



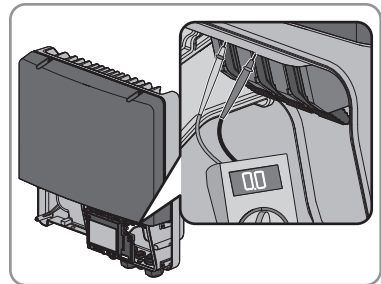
9. Unlock and disconnect all DC connectors. To do this, insert a screwdriver into one of the side slots (blade width: 3.5 mm) and pull the DC connectors straight down. Do **NOT PULL ON THE CABLE** while doing this.



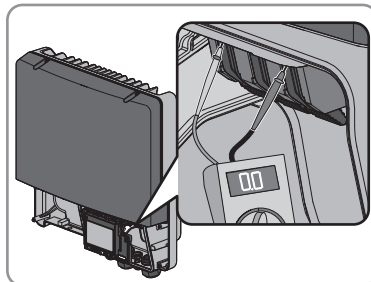
10. Ensure that no voltage is present on the DC inputs using a suitable measuring device.



11. Ensure that no voltage is present on the AC connecting terminal plate between L and N using a suitable measuring device. Insert the test probe (maximum diameter: 2 mm) in each round opening of the terminal.

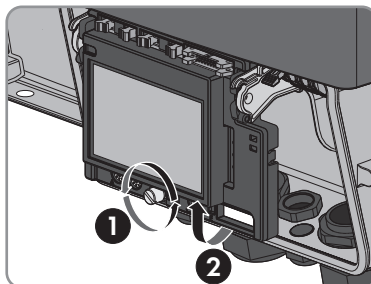


12. Ensure that no voltage is present on the AC connecting terminal plate between L and PE using a suitable measuring device. Insert the test probe (maximum diameter: 2 mm) in each round opening of the terminal.

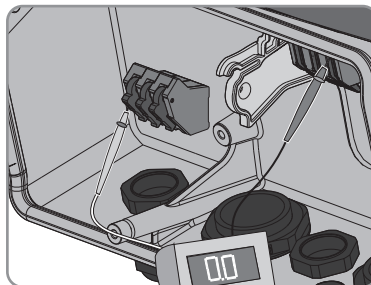


13. Flip the display up to have more space to make the measurement. Loosen the screw on the display to do this.

☒ The display clicks into place.



14. Ensure that no voltage is present between all terminals of the multi-function relay and PE of the AC connecting terminal plate.



15. **NOTICE**

Electrostatic discharges can damage the inverter

The internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Ground yourself before touching any components.

10 Recommissioning the Inverter

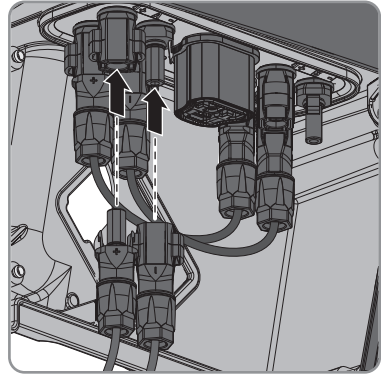
If you have disconnected the inverter from voltage sources (e.g. for configuration purposes) and want to re-commission it, proceed as follows.

Requirements:

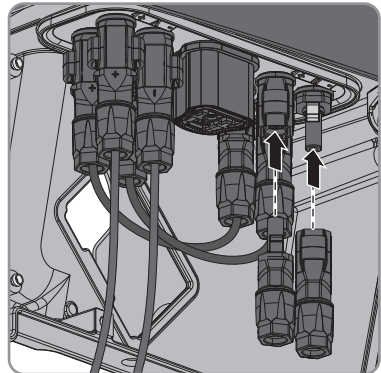
- ☐ The AC miniature circuit-breaker must be correctly rated.
- ☐ A rectifier and overvoltage protection must be installed between the inverter and the plant.
- ☐ The inverter must be correctly mounted.

1. Connect the rectifier to the inverter:

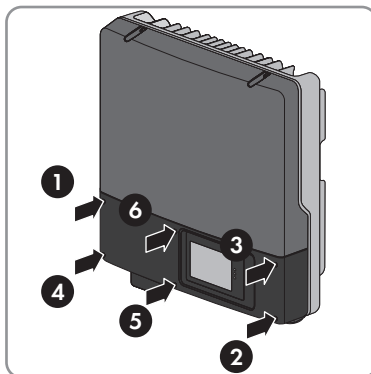
- Connect the positive connection cable to the front positive DC connector of input A on the inverter.
 - Connect the negative connection cable to the front negative DC connector of input A on the inverter.
- ☒ The DC connectors click audibly into place.



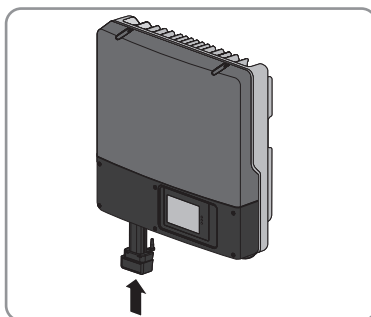
2. Seal all unused DC inputs using the DC connectors with sealing plugs.



3. Place the lower enclosure lid with the 6 screws on the enclosure and secure with screw 6. Then tighten all screws with an Allen key (AF 3) in the order 1 to 6 (torque: 2 Nm).



4. Securely plug in the ESS. The ESS must be aligned parallel to and flush with the enclosure.



5. Switch on the miniature circuit-breaker.
6. Start the small wind turbine system.
 - ☑ The green LED is lit and the display shows the device type, the firmware version, the NetID, the configured country data set and the display language.
 - ✗ Green LED flashing?

Possible cause of error: The DC input voltage is still too low, or the inverter is monitoring the power distribution grid.

 - If the DC input voltage is sufficiently high and the grid start-up conditions are met, the inverter starts to operate.
 - ✗ The red LED is lit and an error message and event number appear in the display?
 - Eliminate the fault (see Section 11 "Troubleshooting", page 59).

11 Troubleshooting

11.1 LED Signals

The LEDs indicate the operating state of the inverter.

LED	Status	Explanation
Green	Is lit	Operation In case of an event, the event message is shown in the display (see Section 11.2.1).
	Flashing	The requirements for the connection to the power distribution grid have not been met. In case of an event, the event message is shown in the display (see Section 11.2.1).
Red	Is lit	Error The display shows the error message and event number (see Section 11.2.2).
Blue	Is lit	<i>Bluetooth</i> communication is activated.

11.2 Messages

11.2.1 Event Messages

Display message	Cause
Update file OK	The update file found is valid.
SD card is read	The inverter is currently reading the SD card.
No new update SDcard	There are no update files relevant for this inverter on the SD card or the available update has already been carried out.
Update communication	The inverter updates the communication component.
Update main CPU	The inverter updates the inverter component.
Update RS485i module	The RS485 communication module (DM-485CB-10) is currently being updated.
Update Bluetooth	The inverter updates the <i>Bluetooth</i> component.
Upd. language table	The inverter updates the language table.
Update completed	The inverter has successfully completed the update.
Grid param.unchanged	The selected rotary switch position is not assigned or it is not possible to change the grid parameters.

Display message	Cause
Inst. code valid	The SMA Grid Guard code entered is valid. Protected parameters have now been unblocked and you can adjust the parameters. The parameters are automatically locked again after ten feed-in hours.
Self-test	The self-test is being carried out.

11.2.2 Error Messages

Event number	Display message	Cause and corrective measures
101 to 103	Grid fault	The line voltage or grid impedance at the termination point of the inverter is too high. The inverter has disconnected from the power distribution grid. Corrective measures: Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
202 to 203, 205	Grid fault	The power distribution grid has been disconnected, the AC cable is damaged or the line voltage at the termination point of the inverter is too low. The inverter has disconnected from the power distribution grid. Corrective measures: • Ensure that the miniature circuit-breaker is switched on. • Ensure that the AC cable is not damaged. • Ensure that the AC cable is connected correctly. • Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.
301	Grid fault	The 10-minute average line voltage is no longer within the permissible range. The line voltage or grid impedance at the termination point is too high. The inverter disconnects from the power distribution grid to comply with the power quality. Corrective measures: • Check that the line voltage at the termination point of the inverter is permanently in the permissible range. If the line voltage is outside the permissible range due to local grid conditions, contact the grid operator. Ask the grid operator whether the voltage can be adapted at the feed-in point or if it would be acceptable to change the monitored operating limits. If the line voltage is permanently in the permissible range and this message is still displayed, contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
401	Grid fault	The inverter is no longer in grid-parallel operation. The inverter has stopped feeding into the power distribution grid. Corrective measures: • Check the grid connection for strong, short-term frequency variations.
501	Grid fault	The power frequency is not within the permissible range. The inverter has disconnected from the power distribution grid. Corrective measures: • If possible, check the power frequency and observe how often fluctuations occur. If there is a high number of fluctuations and this message is displayed frequently, contact the grid operator and ask whether they approve a change of the operating parameters of the inverter. If the grid operator approves, discuss any changes to the operating parameters with the SMA Service Line.
601	Grid fault	The inverter has detected an excessively high proportion of direct current in the line current. Corrective measures: • Check the grid connection for direct current. • If this message is displayed frequently, contact the grid operator and check whether it is possible to raise the limiting value for monitoring on the inverter.

Event number	Display message	Cause and corrective measures
701	Frq. not permitted Check parameter	The power frequency is not within the permissible range. The inverter has disconnected from the power distribution grid. Corrective measures: • If possible, check the power frequency and observe how often fluctuations occur. If there is a high number of fluctuations and this message is displayed frequently, contact the grid operator and ask whether they approve a change of the operating parameters of the inverter. If the grid operator approves, discuss any changes to the operating parameters with the SMA Service Line.
801	Waiting for grid voltage Grid failure Check fuse	The AC cable is not correctly connected or the country data set is not correctly configured. Corrective measures: • Ensure that the AC cable is correctly connected (see Section 6.3.2). • Ensure that the country data set has been configured correctly. • Check fuse.
901	PE conn. missing Check connection	PE not connected correctly Corrective measures: • Ensure that the PE is correctly connected (see Section 6.3.2).
1001	L / N swapped Check connection	The connection of L and N is swapped. Corrective measures: • Ensure that L and N are correctly connected (see Section 6.3.2).
1101	Installation fault Check connection	The connection of L and N is incorrect. Corrective measures: • Ensure that L and N are correctly connected (see Section 6.3.2).

Event number	Display message	Cause and corrective measures
1501	Reconnection fault grid	The changed country data set or the value of a parameter you have set does not correspond to the local requirements. The inverter cannot connect to the power distribution grid. Corrective measures: Ensure that the country data set has been configured correctly. Check the setting of the rotary switches A and B or select the parameter Set country standard or CntrySet and check the value.
3301 to 3303	Unstable operation	The supply at the DC input is not sufficient for stable operation. The inverter cannot connect to the power distribution grid. Corrective measures: Ensure that the small wind turbine system is correctly rated.
3304	Gen. output too low	The small wind turbine system delivers insufficient DC power. The inverter cannot connect to the power distribution grid. Corrective measures: - Wait for stronger wind, if necessary reduce the critical voltage to start feed-in. To do this, change the parameter Critical voltage to start feed-in or A.VStr. - If this message is frequently displayed at medium wind conditions, ensure that the small wind turbine system is correctly rated.

Event number	Display message	Cause and corrective measures
3401 to 3402	DC overvoltage Disconnect generator	Overvoltage at DC input. The inverter may be destroyed. When this message is signaled, it is accompanied by rapid flashing of the backlight. Corrective measures: • IMMEDIATELY DISCONNECT the inverter from voltage sources (see Section 9). • Check the DC voltage to ensure it is below the maximum input voltage of the inverter. If the DC voltage is below the maximum input voltage of the inverter, reconnect the DC connectors to the inverter. • If the DC voltage is above the maximum input voltage of the inverter, ensure that the small wind turbine system and the relevant DC overvoltage protection are correctly rated or contact the small wind turbine system installer. • If this message is repeated frequently, contact the SMA Service Line.
3501	Insulation failure Check generator	The inverter has detected a ground fault in the small wind turbine system. Corrective measures: • Check the small wind turbine system for ground faults (see Section 11.4).
3601	High discharge curr. Check generator	The leakage currents of the inverter and the small wind turbine system are too high. A ground fault, a residual current or a malfunction is present. The inverter interrupts feed-in operation immediately after exceeding a limiting value. When the fault is eliminated, the inverter automatically reconnects to the power distribution grid. Corrective measures: • Check the small wind turbine system for ground faults (see Section 11.4).

Event number	Display message	Cause and corrective measures
3701	Resid.curr.too high	The inverter has detected a residual current after brief grounding of the small wind turbine system. Corrective measures: Check the small wind turbine system for ground faults (see Section 11.4).
3801 to 3802	DC overcurrent Check generator	Overcurrent at the DC input. The inverter briefly interrupts feed-in. Corrective measures: - If this message is frequently displayed, ensure that the small wind turbine system is correctly rated and correctly connected to the rectifier. - Ensure that the DC inputs on the inverter are bridged (see Section 6.4.3).
3901 to 3902	Waiting for DC start conditions Start cond. not met	The conditions for the feed-in to the power distribution grid have not been met. Corrective measures: - Wait for stronger wind, if necessary reduce the critical voltage to start feed-in. To do this, change the parameter Critical voltage to start feed-in or A.VStr. - If this message is frequently displayed at medium wind conditions, ensure that the small wind turbine system is correctly rated.
6001 to 6009	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6101 to 6112	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6202	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6301	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
6304 to 6306	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6314	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6401 to 6411	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6415 to 6416	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6438	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6501 to 6502	Self diagnosis Overtemperature	The inverter has switched off due to an excessive temperature. Corrective measures: - Clean the cooling fins and air ducts (see Section 1.1.3). - Ensure that the inverter has sufficient ventilation.
6603 to 6604	Self diagnosis Overload	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
6701 to 6702	Comm. disturbed	Internal error. The inverter continues to feed into the power distribution grid. Corrective measures: Contact the SMA Service Line.
6801 to 6802	Self diagnosis Input A defective	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
6901 to 6902	Self diagnosis Input B defective	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
7001 to 7002	Sensor fault	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
7008	Disturbance sensor display temperature	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
7101	SD card defective	SD card is not correctly formatted. Corrective measures: - Re-format the SD card. - Re-save the files to the SD card.
7106	Update file defect.	Update file on the SD card is faulty. Corrective measures: - Re-format the SD card. - Re-save the files to the SD card.
7110	No update file found	No update file found. Corrective measures: Copy the update file in the SD card folder. To do this, select the \UPDATE folder.
7201 to 7202	Data stor. not poss.	Internal error. The inverter continues to feed into the power distribution grid. Corrective measures: Contact the SMA Service Line.
7303	Update main CPU failed	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.

Event number	Display message	Cause and corrective measures
7305	Update RS485i module failed	Internal error. The inverter continues to feed into the power distribution grid. Corrective measures: • Re-try update. • If this message is displayed again, contact the SMA Service Line.
7307	Update BT failed	Internal error. The inverter continues to feed into the power distribution grid. Corrective measures: • Re-try update. • If this message is displayed again, contact the SMA Service Line.
7311	Update language table failed	Internal error. The inverter continues to feed into the power distribution grid. Corrective measures: • Re-try update. • If this message is displayed again, contact the SMA Service Line.
7401	Varistor defective	At least 1 of the thermally monitored varistors is defective. Corrective measures: • Check the function of the varistors (see section 11.5).
7508	External fan fault	The external fan is defective or blocked. Corrective measures: • Ensure that the fan is clean. • Ensure that the external fan is correctly connected.
7701 to 7703	Self diagnosis Interference device	The cause must be determined by the SMA Service Line. Corrective measures: • Contact the SMA Service Line.
8001	Derating occurred	The inverter has reduced its power output for more than ten minutes due to excessive temperature. Corrective measures: • If this message is frequently displayed, clean the cooling fins and air ducts (see Section 11.3). • Ensure that the inverter has sufficient ventilation.

Event number	Display message	Cause and corrective measures
8101 to 8104	Comm. disturbed	The cause must be determined by the SMA Service Line. Corrective measures: Contact the SMA Service Line.
9002	Inst. code invalid	The SMA Grid Guard code entered is incorrect. The parameters are still protected and cannot be changed. Corrective measures: Enter the correct SMA Grid Guard code.
9003	Grid param. locked	The parameters are locked. The parameters cannot be changed. Corrective measures: Unlock the parameters with the SMA Grid Guard code.
9005	Waiting for main CPU. Ensure DC supply	DC supply is insufficient. The inverter was not able to adopt the parameter change. Corrective measures: - Ensure that the rectifier is correctly connected (see Section 6.4.3). - Ensure that the small wind turbine system provides sufficient DC voltage in windy conditions.
9007	Abort self-test	The self-test was stopped due to DC voltage being too low. Corrective measures: Wait for sufficient wind.

11.3 Cleaning the Inverter

• **NOTICE**

Damage to the display due to the use of cleaning agents

- If the inverter is dirty, clean the enclosure lid, the display, and the LEDs using only clean water and a cloth.
- If the cooling fins on the rear of the enclosure are dirty, clean them with a soft brush.
- If the air ducts on the top of the inverter are dirty, clean them with a soft brush.

1.1.4 Checking the Small Wind Turbine System for Ground Faults

If the inverter displays the event numbers **3501**, **3601** or **3701**, there could be a ground fault.

⚠ WARNING

Danger to life due to electric shock

In the event of a ground fault, high voltages can be present.

- Only touch the cables of the small wind turbine system on their insulation.
- Do not connect DC cables with ground faults to the inverter.

NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range up to at least 1,000 V.

Check the small wind turbine system for ground faults according to the following procedure.

1. Disconnect the inverter from voltage sources (see Section 9).
2. Disconnect the Windy Boy Protection Box from voltage sources (see installation manual of the Windy Boy Protection Box).
3. Measure resistances:
 - Measure resistance between L1 of the small wind turbine system and the ground potential, and record value.
 - Measure resistance between L2 of the small wind turbine system and the ground potential, and record value.
 - Measure resistance between L3 of the small wind turbine system and the ground potential, and record value.

If the measured resistances are smaller than $10\ \Omega$, there is a ground fault present.
Eliminate the ground fault.

If the measured resistances are almost infinite, there is no ground fault present in the small wind turbine system. Ensure that there is no ground fault in the connection cables on the inverter.

4. Re-commission the inverter (see Section 10).

11.5 Checking the Function of the Varistors

If the inverter displays event number **7401**, one of the varistors is probably defective. Check the function of each varistor as described below.

NOTICE

Destruction of the inverter due to overvoltage

If varistors are missing, the inverter is no longer protected against overvoltage.

- Do not operate the inverter without varistors in plants with a high risk of overvoltages.
- Only re-commission the inverter after you have replaced the defective varistors.

NOTICE

Destruction of the measuring device due to overvoltage

- Only use measuring devices with a DC input voltage range up to at least 1,000 V.

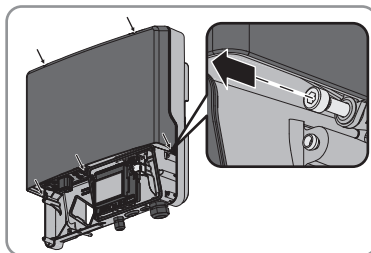
1. Disconnect the inverter from voltage sources (see Section 9).

2. DANGER

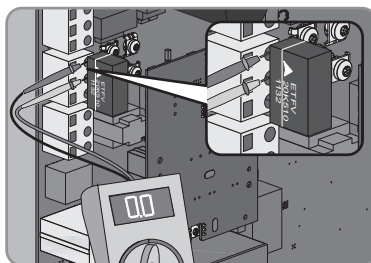
Danger to life due to high voltages

- Wait five minutes before opening the upper enclosure lid.

3. Loosen the screws on the upper enclosure lid using an Allen key (AF 4) and remove the enclosure lid.



4. Use a multimeter to measure whether there is a conductive connection between the upper and the middle connection wire.



If there is no conductive connection present, the varistor is defective. SMA Solar Technology AG recommends replacing all varistors immediately.

- Order new varistors and insertion tools (see Section 14 "Accessories", page 89).
- If new varistors are available, replace all varistors (see Section 11.6).

If there is a conductive connection present, contact SMA Service Line.

11.6 Replacing the Varistors

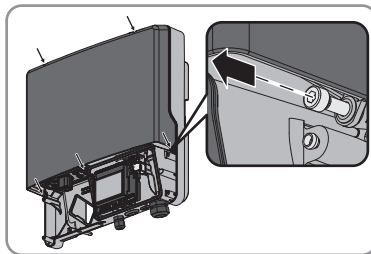
1. Disconnect the inverter from voltage sources (see Section 9).

2. **⚠ DANGER**

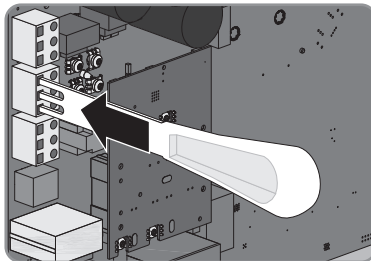
Danger to life due to high voltages

- Wait five minutes before opening the upper enclosure lid.

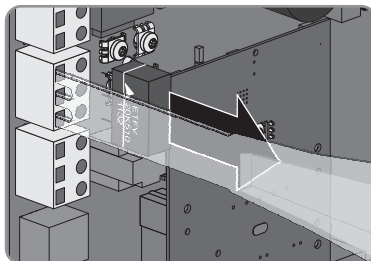
3. Loosen the screws on the upper enclosure lid with an Allen key (AF 4) and remove the enclosure lid.



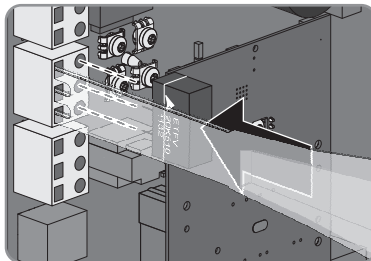
4. Insert the insertion tool into the clamp contacts of the terminal block.



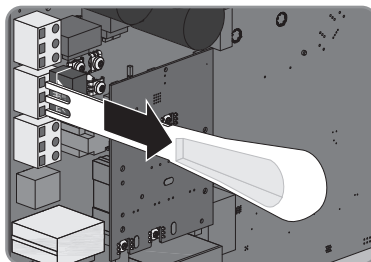
5. Pull the varistor out of the terminal block.



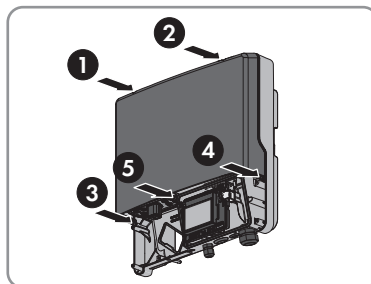
6. Insert the new varistor into the terminal. The marking on the varistor must point left to the enclosure.



7. Remove the insertion tool from the contacts of the terminal block.



8. Place the upper enclosure lid with the 5 screws and conical spring washers on the enclosure and tighten them using an Allen key (AF 4) in the order 1 to 5. The teeth of the conical spring washer must face the enclosure lid.

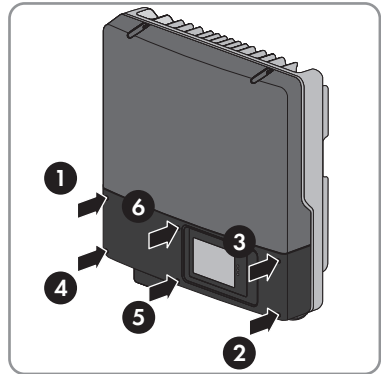


9. Re-commission the inverter (see Section 10).

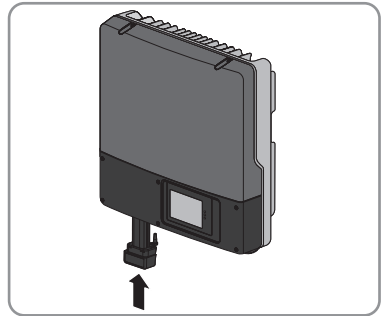
12 Decommissioning

12.1 Disassembling the Inverter

1. Disconnect the inverter from voltage sources (see Section 9).
2. Remove the AC cable from the inverter.
3. If you are using a multi-function relay, remove the cable from the inverter.
4. If a data cable is connected, remove the data cable from the inverter.
5. Place the lower enclosure lid with the 6 screws on the enclosure and secure using 6 screws. Then tighten all screws with an Allen key (AF 3) in the order 1 to 6 (torque: 2 Nm).



6. Securely plug in the ESS. The ESS must be aligned parallel to and flush with the enclosure.

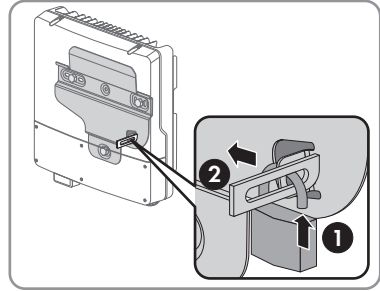


7. **CAUTION**

Risk of burns due to hot enclosure parts

- Wait 30 minutes for the enclosure to cool down.

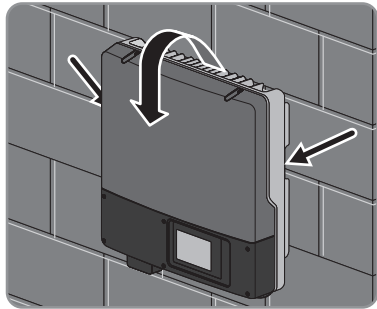
8. If the inverter is protected against theft, open the padlock and remove it.



9. **⚠ CAUTION**

Risk of injury when taking down the inverter

- Keep in mind the weight of the inverter (see Section 13 "Technical Data", page 77).
- Lift the inverter off the wall mounting bracket. Use the recessed grips at the side and transport the inverter in a horizontal position.



12.2 Packing the Inverter

- Pack the inverter. Use the original packaging or packaging that is suitable for the weight and dimensions of the inverter (see Section 13 "Technical Data", page 77).

12.3 Disposing of the Inverter

- Dispose of the inverter in accordance with the locally applicable disposal regulations for electronic waste.

or

Return the inverter to SMA Solar Technology AG at your own expense (see Section 15 "Contact", page 90). When doing so, label the packaging "ZUR ENTSORGUNG" ("FOR DISPOSAL").

13 Technical Data

13.1 DC/AC

13.1.1 Windy Boy 3000TL

DC input

Maximum DC power at $\cos \varphi = 1$	3,200 W
Maximum input voltage	550 V
Operating voltage range	80 V to 500 V
Rated input voltage	400 V
Minimum open-circuit voltage for activating turbine operation	125 V
Maximum input current	30 A
Maximum input current per DC input range on the inverter	15 A
Number of independent DC input ranges	2

AC output

Rated power at 230 V, 50 Hz	3,000 W
Maximum apparent AC power	3,000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	180 V to 280 V
Nominal AC current at 220 V	13.6 A
Nominal AC current at 230 V	13.0 A
Nominal AC current at 240 V	12.5 A
Maximum output current	16 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% of the rated power	≤ 4%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	55 Hz to 65 Hz
Power factor at rated power	1
Displacement power factor, adjustable	0.8 _{overexcited} to 0.8 _{underexcited}
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* depending on the country setting

Efficiency

Maximum efficiency, $\eta_{\max}$	97.0%
European weighted efficiency, η_{EU}	96.0%

13.1.2 Windy Boy 3600TL

DC input

Maximum DC power at $\cos \varphi = 1$	3,880 W
Maximum input voltage	550 V
Operating voltage range	80 V to 500 V
Rated input voltage	400 V
Minimum open-circuit voltage for activating turbine operation	125 V
Maximum input current	30 A
Maximum input current per DC input range on the inverter	15 A
Number of independent DC input ranges	2

AC output

Rated power at 230 V, 50 Hz	3,680 W
Maximum apparent AC power	3,680 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	180 V to 280 V
Nominal AC current at 220 V	16 A
Nominal AC current at 230 V	16 A
Nominal AC current at 240 V	15.3 A
Maximum output current	16 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% of the rated power	≤ 4%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	55 Hz to 65 Hz
Power factor at rated power	1
Displacement power factor, adjustable	0.8 _{overexcited} to 0.8 _{underexcited}
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* depending on the country setting

Efficiency

Maximum efficiency, $\eta_{\max}$	97.0%
European weighted efficiency, η_{EU}	96.4%

13.1.3 Windy Boy 4000TL

DC input

Maximum DC power at $\cos \varphi = 1$	4,200 W
Maximum input voltage	550 V
Operating voltage range	80 V to 500 V
Rated input voltage	400 V
Minimum open-circuit voltage for activating turbine operation	125 V
Maximum input current	30 A
Maximum input current per DC input range on the inverter	15 A
Number of independent DC input ranges	2

AC output

Rated power at 230 V, 50 Hz	4,000 W
Maximum apparent AC power	4,000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	180 V to 280 V
Nominal AC current at 220 V	18.2 A
Nominal AC current at 230 V	17.4 A
Nominal AC current at 240 V	16.7 A
Maximum output current	22 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% of the rated power	≤ 4%
Rated power frequency	50 Hz
AC power frequency*	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	55 Hz to 65 Hz
Power factor at rated power	1
Displacement power factor, adjustable	0.8 _{overexcited} to 0.8 _{underexcited}
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* depending on the country setting

Efficiency

Maximum efficiency, $\eta_{\max}$	97.0%
European weighted efficiency, η_{EU}	96.4%

13.1.4 Windy Boy 5000TL

DC input

Maximum DC power at $\cos \varphi = 1$	5,200 W
Maximum input voltage	550 V
Operating voltage range	80 V to 500 V
Rated input voltage	400 V
Minimum open-circuit voltage for activating turbine operation	125 V
Maximum input current	30 A
Maximum input current per DC input range on the inverter	15 A
Number of independent DC input ranges	2

AC output

Rated power at 230 V, 50 Hz	4,600 W
Maximum apparent AC power*	5,000 VA
Rated grid voltage	230 V
Nominal AC voltage	220 V/230 V/240 V
AC voltage range	180 V to 280 V
Nominal AC current at 220 V	20.9 A
Nominal AC current at 230 V	20 A
Nominal AC current at 240 V	19.2 A
Maximum output current	22 A
Total harmonic factor of the output current with total harmonic factor of the AC voltage < 2%, and AC power > 50% of the rated power	≤ 4%
Rated power frequency	50 Hz
AC power frequency**	50 Hz/60 Hz
Operating range at AC power frequency 50 Hz	45 Hz to 55 Hz
Operating range at AC power frequency 60 Hz	55 Hz to 65 Hz
Power factor at rated power	1
Displacement power factor, adjustable	0.8 _{overexcited} to 0.8 _{underexcited}
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* for country settings VDE-AR-N-4105: 4,600 VA

** depending on the country setting

Efficiency

Maximum efficiency, $\eta_{\max}$	97.0%
European weighted efficiency, η_{EU}	96.5%

13.2 General Data

Width x height x depth with Electronic Solar Switch	490 mm x 519 mm x 185 mm
Weight	26 kg
Length x width x height of packaging	597 mm x 617 mm x 266 mm
Transport weight	30 kg
Climatic category according to IEC 60721-3-4	4K4H
Operating temperature range	-25°C to +60°C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above mean sea level	2,000 m
Noise emission (typical)	25 dB(A)
Power loss in night operation	< 1 W
Topology	Transformerless
Cooling concept	Convection
Degree of protection according to IEC 60529	IP65
Protection class (according to IEC 62103)	I

13.3 Protective Devices

DC reverse polarity protection	Short-circuit diode
DC disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current capability	Current control
Grid monitoring	SMA Grid Guard 3
Maximum permissible fuse protection for WB 3000TL-21	25 A
Maximum permissible fuse protection for WB 3600TL-21	32 A
Maximum permissible fuse protection for WB 4000TL-21	32 A
Maximum permissible fuse protection for WB 5000TL-21	32 A
Ground-fault monitoring for WB 3000TL-21	Insulation monitoring $R_{iso} > 625 \text{ k } \Omega$
Ground-fault monitoring for WB 3600TL-21	Insulation monitoring $R_{iso} > 550 \text{ k } \Omega$
Ground-fault monitoring for WB 4000TL-21	Insulation monitoring $R_{iso} > 500 \text{ k } \Omega$
Ground-fault monitoring for WB 5000TL-21	Insulation monitoring $R_{iso} > 400 \text{ k } \Omega$
All-pole sensitive residual-current monitoring unit	Available

13.4 Climatic Conditions

According to IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	-25°C to +60°C
Extended humidity range	0% to 100%
Extended air pressure range	79.5 kPa to 106 kPa

According to IEC 60721-3-2, transport type E, class 2K3

Temperature range	-25°C to +70°C
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13.5 Features

DC connection	SUNCLIX DC connector
AC connection	Spring clamp terminal
Display	LC graphic display
Bluetooth® Wireless Technology	As standard
RS485, galvanically isolated	Optional
Speedwire Data Module	Optional
Webconnect Data Module	Optional
Multi-function relay	Optional

13.6 Torques

Upper enclosure lid screws	6 Nm
Lower enclosure lid screws	2 Nm
Additional ground terminal	6 Nm
SUNCLIX swivel nut	2 Nm
RS485 interface fastening screw	1.5 Nm
Multi-function relay fastening screw	1.5 Nm

13.7 Grounding Systems

TN-C system	Suitable
TN-S system	Suitable
TN-C-S system	Suitable
TT system, if $U_{N\_PE} < 1.5 \text{ V}$	Suitable

13.8 Data Storage Capacity

Daily energy yield	63 days
Daily yields	30 years
Event messages for end users	250 events
Event messages for installers	250 events

13.9 Multi-Function relay

Maximum AC switching voltage	240 V
Maximum DC switching voltage	30 V
Maximum AC switching current	1.0 A
Maximum DC switching current	1.0 A
Terminal	3-pole spring clamp terminal
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with*	100,000 switching cycles

* corresponds to 20 years with 12 switching operations per day

14 Accessories

You will find relevant accessories and spare parts for your product in the following overview. If required, you can order them from SMA Solar Technology AG or from your specialty retailer.

Description	Brief description	SMA order number
Electronic Solar Switch	ESS as spare part	ESS-HANDLE*
Insertion tool for replacement of varistors	Insertion tool for varistors	SWR-TWVZ
Replacement varistors	Set with 3 thermally-monitored varistors incl. insertion tool	MSWR-TV9
Multi-function relay retrofit kit	Multi-function relay for retrofitting in PV inverters	MFRO1-10
RS485 retrofit kit	RS485 interface	DM-485CB-10
Speedwire Data Module	Communication interface for Speedwire communication	SPWDM-10
Webconnect Data Module	Communication interface for Speedwire communication and connection to Sunny Portal	WEBCONDM-10
Fan retrofit kit	Fan to be installed in the inverter for supplementary cooling	FANKIT01-10
SUNCLIX DC connector	Field plug for wire sizes of 2.5 mm ² to 6 mm ²	SUNCLIX-FC6-SET

* When ordering a new ESS, always indicate the device type and serial number of the inverter.

15 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We need the following data in order to provide you with the necessary assistance:

- Inverter device type
- Inverter serial number
- Firmware version of the inverter
- Special country-specific settings of the inverter (if applicable)
- Type and power of the small wind turbine system connected
- Mounting location and mounting altitude of the inverter
- 3-digit or 4-digit event number and display message of the inverter
- Optional equipment, e.g. communication products
- Type of use of the multi-function relay (if present)

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